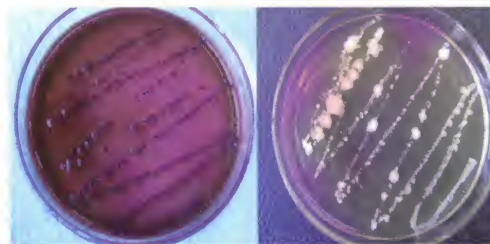


Annual Report 2011-12



Bangladesh Agricultural Research Council



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2011-2012

Bangladesh Agricultural Research Council

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Executive Summary

Governing Body Meeting

The 39th Governing Body Meeting was held 29 September 2011 to review the implementation and progress of the decisions taken in the previous meeting. Human Resource Development Plan for NARS in Bangladesh has been placed in the Meeting for discussion. The distinguished members have given emphasis on the development of human resources through relevant training and higher education keeping in mind the purpose of the research priority setting. A draft report on Crop Zoning was also presented in the meeting for discussion. The report identifies the soils and agro-climate favorable to grow 12 major crops and presents those in map for easy understanding. Maps on soil moisture, active soil depth, nutritional status, soil acidity and salinity, agro-climatic factors, etc. have been demonstrated in the meeting. The meeting discussed and reviewed the draft report and opined for further discussion of the plan and for their approval as well.

Executive Council Meeting

The 92nd, 93rd, 94th, 95th and 96th Executive Council Meetings were held on 11 August 2011, 11 August 2011, 5 December 2011, 22 December 2011 and 20 February 2012 respectively. The 1st Executive Council Meeting (according to "Council Law 2012") was held on 25 June 2012. The 92nd Executive Council approved among others the enhanced monthly allowances for Post-Doctoral Fellowship under PIU-BARC, NATP: Phase-I for countries of different regions, research proposal and budget of BRRI and discussed the gratuity and service rule for the recruitment of SSO, PSO and CSOs of the NARS institutes. The 93rd Executive Council Meeting discussed and approved 12 SPGR Proposals and budgets, and allocation of revenue budget for core research, training and other items. The 94th Executive Council Meeting discussed and reviewed the research proposals and approved budgets of BARI, BJRI and BFRI. The 95th and 96th Executive Council Meeting approved the research proposal and budget of BSRI SRDI and BINA for the year 2011-12. The 1st Executive Council Meeting (according to "Council Law-2012") approved the research proposals and budgets of BFRI (Fisheries) and BTRI for the year 2011-12. It also approved the enhanced monthly allowance for In-country PhD Scholars.

Programme Development and Implementation

Bangladesh Agricultural Research Council has the responsibility to develop and implement the research programme. During this period the coordinated projects (1) Development of Variety, Cropping System Research and Technology Transfer of Major Cereal for Sustainable Food Security in Bangladesh, (2) Collection, Characterization and Utilization of Rice, Minor Cereals and Chilli in Bangladesh, (3) Development and Up Scaling of Integrated Pest Management Technologies in Vegetable Crops; (4) Coordinated sub-project on Farming System Research and Development for Farmers' Livelihoods Improvement, and (5) Coordinated Sub-Project on Characterization of Important Plant Genetic Resources have been implemented.

The Project Implementation Unit (PIU) of Bangladesh Agricultural Research Council (BARC) is implementing the research component of National Agricultural Technology Project (NATP). A total of 102 Sponsored Public Goods Research (SPGR) sub-projects in selected identified thematic areas have implemented at different NARS institutes and public universities of the country.

Research Management and Coordination

To facilitate research and technology transfer activities the Bangladesh Agricultural Research Council has been providing research grants to various public organizations. During the period research and development programmes of the NARS and the agricultural universities have been coordinated through funding of the core research, technology transfer and human resource development and organized frequent review and desk/field monitoring for successful implementation of the programmes. An amount of Taka 112.78 lakhs has been provided to support the core research and technology transfer programmes.

Programme Review and Monitoring

Eight teams were formed with the scientists of BARC for field monitoring of the Research/Technology Transfer Programmes carried out during the period. The teams have been assigned to visit and monitor the BARC funded Research/Technology Transfer Programmes implemented by different NARS and associate institutes. In the Progress Review

workshop, the research achievements of the past year have been reviewed and to identified the constraints and possible solutions thereof in implementing research programmes. Research Review and Program Planning Workshops of NATP funded and BARC implemented Sub-Projects have been conducted where sub-projects during 2011-12 and programs for 2012-13 were reviewed and discussed. Suggestions and comments from the workshops have been incorporated for improvement of the programs.

To make the participants conversant with project planning and management, a training workshop was conducted taking the participants from among the NARS institutes and the associate organizations. The course content included the topics on project cycle, project appraisal, logical framework, preparation of different types of project documents (DPP/RDPP/TPP), critical path method, result based monitoring, PPR-2008, financial delegations etc. The workshop was conducted based on class lectures, practical sessions and open discussions. The training workshop would be helpful for the participants to prepare and manage different kinds of projects properly and efficiently.

Review and and Finalization of Work Plan

Achievement of Work Plan of the previous year and finalization of Work Plan for the 2011-12 was done was reviewed where Executive Chairman, BARC and Member Directors, CSO, PSO and others officers from different divisions/centres/units attended. Each division/unit presented its progress of activities of the year 2010-11 and the work plan of the year 2011-12. Each presentation was followed by discussion on matters relating to justification and usefulness of the activities undertaken. It was felt necessary to establish more coordination among different divisions /centres/units of BARC with respect to major activities.

Updating of Fertilizer Recommendation Guide

Updating of Fertilizer Recommendation Guide (FRG) at five years interval is a mandate of BARC. For financial assistance in updating activities of FRG-2012, a one-year duration SPGR Sub-Project was being implemented since June 2011. Drafting of the Guide has been completed by March 2012. Two workshops were organized on the draft Guide during 2011-12. Scientists from different NARS institutes,

senior scientists, university teachers, extension personnel, BADC officers and other concerned personnel attended the workshops. The draft FRG-2012 was presented in the workshops. Suggestions and comments from the participants of the workshops have been incorporated to finalize the FRG-2012.

Foundation Training

Foundation Training for the scientists of the National Agricultural Research System (NARS) scientists is was arranged every year. The 22nd course was held on June 3, 2012 at Bangladesh Academy for the Rural Development (BARD) in Comilla. The course duration was from 05 February to 03 June 2012 in which 39 participants took part. The program was organized by BARD Comilla and sponsored by Bangladesh Agricultural Research Council (BARC), Dhaka. The newly recruited Scientific Officers from different NARS institutes were the participants in this course. The objective of this four month long training program was to make the NARS scientists aware of the government financial and management rules.

Administrative and Financial Management

A Training Program on Administrative and Financial Management was organized during March 23, 2011 to April 6, 2011 at Bangladesh Academy for Rural Development, Comilla. A total number of 18 PSOs and CSOs from different NARS institutes participated in the program. The objective of the training program was to provide senior levels scientists/research managers with the modern concepts of administrative and financial management system. This program would help increase efficiency of the NARS senior level scientists and thus good governance and productivity will be ensured in the NARS institutes. Besides, three trainings on Financial Management of SPGR Sub-projects were also held during this period where 71 participants attended.

Human Resource Development

In-Country PhD: BARC offered higher studies for NARS scientists in various disciplines of cross cutting issues of agriculture and beyond. Eighteen in-country PhD offered in the previous years have been followed up in disbursing monthly allowances upon submission of progress reports. Under PIU-BARC, NATP: Phase-1 60 PhD programmes have been offered in different public universities within the

country. The PhD scholarships have been selected from among the NARS institutes. It may be mentioned here that all of PhD scholars' have already completed their courses and most of them completed their field research.

Foreign PhD: Under the PIU-BARC: NATP, 30 slots were earmarked for foreign PhD programs for the scientists of the NARS. The prospective candidates nominated by the concerned institutes of NARS were interviewed and finally selected by the same committee. Award letters have been issued and all the selected PhD scholars have taken admission in the universities of different countries like Malaysia, Thailand, China, Philippines, India and Sri Lanka.

Post-doctoral Fellowships: As per provision of NATP there are 10 post-doctoral fellowships for a period of 6-8 months of which 8 post-doctoral fellowships have been selected mainly for developing countries. Of them two have completed their post-doctoral fellowships.

Training/seminar/workshop/meeting: A total number of 32 research managers/scientists under different fields of agriculture attended foreign training/seminar to help enrich their professional knowledge at par with the global situation. Besides, number of local training/seminar/workshops etc. in different fields of agriculture was organized where a large number of research managers/scientists/administrators/extension professionals, farmers, development partners and NGO activists have been benefited.

Establishment of ICT and MIS facilities at NARS

Procurement, installation and commissioning of ICT equipment like Server, PC, Laptop, Printer, Router, Switch, Firewall etc. have been installed at BARC and 7 NARS institutes. Local Area Network (LAN) was set-up in each of these organizations and Virtual Private Network (VPN) was established between BARC and each of 7 NARS institutes. In order to cater information need for respective stakeholders and create information hub, Data Center is established at BARC as per required standard. The ICT infrastructure thus created can now be used for deployment of MIS, Video Conferencing and other ICT related services of NARS.

Support for outsourcing process of MIS development for NARS which will be deployed at the BARC Data Center and individual NARS institutes has been provided. The MIS would cover different modules like research management, financial, inventory, human resources, library, procurement, training, vehicle management, agricultural technology, gene bank related information management. Once the entire system is operational, it would help policy makers, planners, research managers of NARS organizations to run their day-to-day activity as well as overall decision making in a planned and well-organized way resulting enhancement of institutional efficiency and governance.

Land Suitability Assessment and Crop Zoning

The main purpose of the activity was to delineate suitable areas for growing particular crop in order to harvest maximum potential yield. Wherein soil, land and climatic factors were considered and the limiting factors for those with respect to crop requirement were determined on the basis of expert judgment. Subsequently, suitability maps of different crops are produced by upazilas and districts. The crop zoning maps were produced considering the percentage of the total cultivable area of the upazila under each crop suitability classes. In classifying the crop zone some criteria were followed which are described in the book "Land Suitability Assessment and Crop Zoning of Bangladesh". The crop zoning provides the opportunity to grow the selected crops in different zones according to suitability.

Establishment of Agricultural technology information network in Asia

In global context, the development of ICT has proven its potentials for enhancing development efforts, but also virtually reduced the distance and turned the world into a global village. The establishment of web based agricultural technology information network, an initiative taken by AFACI can turn out to be an important gateway for sharing of knowledge and expertise among the member countries and the globe. In this context, agricultural technology information has been collected to publish agricultural technology handbook. Publishing process of the book was in progress. Also the content preparation of agricultural technology and uploading of the same in locally developed AFACI website was in progress.

I. HIGHLIGHTS OF RESEARCH AND DEVELOPMENT

CROPS

Programme/Project Development

BARC has the responsibilities to provide technical inputs to research programmes developed by the NARS institutes. As a part of these activities, Crops Division of BARC organized review workshops on crop improvement, integrated pest management, seed quality etc. Scientists of Crops Division attend annual research review workshop of NARS institutes and provide technical inputs/ suggestions on the relevant subjects for the improvement of annual research programmes. Some coordinated projects implemented during 2011-12 were (1) Development of Variety, Cropping System Research and Technology Transfer of Major Cereal for Sustainable Food Security in Bangladesh, (2) Collection, Characterization and Utilization of Rice, Minor Cereals and Chilli in Bangladesh, (3) Development and Up Scaling of Integrated Pest Management Technologies in Vegetable Crops; (4) Coordinated sub-project on Farming System Research and Development for Farmers' Livelihoods Improvement, and (5) Coordinated Sub-Project on Characterization of Important Plant Genetic Resources

Project Implementation

1. Development of Variety, Cropping System Research and Technology Transfer of Major Cereals for Sustainable Food Security in Bangladesh (AFACI)

The crop variety and component technologies have been developed so far addressed the plain land agriculture and normal ecosystem. But the situation is changing due to climatic changes. For these, participatory research, demonstrations, field trials, farmers training, field day etc. could be initiated for successful adoption of the appropriate/modern technologies. The AFACI is an initiative of RDA, Republic of Korea to support Asian countries to stimulate the sustainable agricultural growth through the international R&D cooperation in agriculture and food sector. In this context, a project entitled "Development of variety, cropping system research and technology transfer of major cereals for sustainable food security in Bangladesh" was initiated in June, 2010. BARI, BRRI, DAE and BADC are involved in implementing the project activities while BARC is involved as coordinating body. The specific objectives was to develop and evaluate advanced materials for higher yield, tolerant to salinity, submergence, temperature for rice and wheat (where applicable) and to develop participatory research and technology transfer programme for sustainable crop production and to update the knowledge and skills of agricultural professionals

through training/visit/study tour/exchange programme. The overall goal of the project is to increase agricultural production through variety development, cropping system, technology transfer for sustainable food security. Plant Breeding, Rice Farming and Applied Research Division of BRRI is implementing the research programmes. Results of the BRRI experiment showed that some genotypes of rice including BRRI dhan47 gave better performance in saline area. The submergence tolerant variety BRRI dhan 52 showed high yield in 14 days flooding with flooding depth 30-75cm. Double transplanting allowed to fit short duration mustard variety BARISHarisha14 in T aman- Mustard-Boro pattern. Besides, alternate wet and drying (AWD) with USG showed better performance than prilled urea. Wheat research centre, BARI carried out research on wheat where genotype BAW1141 showed higher yield under high temperature conditions. BARI Gom 23, 24 and 25 with improved management packages in coastal areas produced grain yield of 2.63 t/ha to 3.06 t/ha, respectively. The variety BARI Gom26 gave higher grain yield (4.01 t/ha) followed by BARI Gom 25 in Rajbari and Faridpur. DAE demonstrated wheat variety Pradip in non- traditional wheat area, Bagerhat which gave grain yield of 3.5-4.0 t/ha. BADC produced 2 ton of quality seeds of BRRI dhan 29. Besides, respective organizations arranged farmers training and field days in different locations to motivate the farmers to grow recent developed rice and wheat variety with management packages. Seeds of newly developed variety of rice and wheat with management packages in new areas might have influence on food security. Some of the highlights of the project activities are summarized below:

Bangladesh Rice Research Institute

- Hybridization of submergence tolerant T aman rice varieties were made by using 12 parents. A total of 1137 seeds were produced and stored.
- Screening for flash flood submergence tolerance genotypes of rice varieties were done, among the genotypes, 32 genotypes were found better which survivability ranges from 92- 100% and survivability score 3.
- Advanced yield trial (AYT) for Deep Water Rice (B. aman) genotypes BR224-2B-2-5 showed highest yield (3.1t/ha) followed by BR5915-B-7 (2.8t/ha) and BR5915-B-34 (2.5t/ha).
- Two hundred desirable progenies were selected from 4 F₂ populations and preserved to grow in next boro season.
- Genotype BR8131-24-1 performed slightly better than BRRI dhan 47, BRRI dhan 55 and Binadhan-8 in Boro season in Sathkira.
- Among 27 genotypes only 5 genotypes showed tolerant

to moderately tolerant in Set-1. Similarly 4 genotypes also showed tolerant to moderately in Set-2.

- Local variety Laxmidigha performed better as DWR followed by Boro rice (Var. BRRIdhan 29) in cropping system research.
- Double transplanting allowed introducing short duration rapeseed mustard BRRISharishal4 in T.aman/ B. aman- Boro system
- Rice production by using USG applicator and LCC in T.aman rice, BRRIdhan 49 produced higher grain yield (4.8 t/ha) than BRRIdhan 34 and 37 in Comilla. Growth duration of the varieties grown in Comilla was more or less similar (134-137 days). In Satkhira, the variety BR23 produced grain yield 5.1 t/ha with growth duration of 144 days.
- Twelve and 19 farmers trainings were conducted in Satkhira and Comilla during T. Aman, 2011 and Boro season, 2012 where 25-30 farmers and 5-10 SAAO of DAE were participated. Two field days were conducted in Boro season, 2012 at Comilla in Boro season, 2012 and Satkhira where 200 participants were attended.

Bangladesh Agricultural Research Institute

- Forty single crosses consisting of high yielding heat and salinity parents of wheat were made at Gazipur. Among the combinations, 25 crosses were aimed to develop high yielding heat tolerant varieties and 10 for developing saline tolerant varieties. The F1 seeds will be confirmed next season in the field.
- Fifty advance lines of wheat were grown at Gazipur under two growing environments: (a) Irrigated timely sown and (b) irrigated late sown (ILS) with transparent polythene cover grain at filling stage. Among 50 genotypes, 22 had SSI value less than unity of which E1, E2, E3, E5, E9, E20, E21, E26, E37 and E42 showed high stress tolerance index as high value for yield stability index.
- Fifty genotypes of wheat were tested against salinity under laboratory conditions at Gazipur. The genotypes 3,8,23,31,37,38,40 and 42 showed better response to salt stress with the highest tolerance index on the basis of shoot dry weight and genotypes 8,11,27,28, and 48 on the basis of seedling height.
- Wheat entries 10, 11, 12,14,15,16 and 25 showed tolerance to 10-12 mS/cm at Noakhali whereas Satkhira entries 2,3,8,9,10,11,15, and 16 were found tolerance to salinity levels 6-16 mS/ cm.
- Wheat variety BARI Gom 25 and 26 showed similar yield performance (3.5 t/ha) at Faridpur followed by Jute- T.aman cropping pattern.
- Tillage option and varieties block demonstration showed that highest yield (6.07 t/ha), gross return and BCR (4.66) in BARI Gom-24 with bed planter at Shibpur, Rajshahi.

- One hundred farmers were trained in 4 batches at 4 locations at Faridpur, Rajshahi and Barisal on wheat cultivation and seed preservation.
- Four field days were arranged at Barisal, Faridpur and Rajshahi where 360 farmers, extension personnel attended.

Department of Agriculture Extension

- Block demonstration were conducted with saline tolerant rice varieties (BRRIdhan 47 and Binadhan 8) where Urea super granules were used instead of prilled urea in a 9 ton. Total area is 9 ha of land. Grain yield was found on an average 7.01 t/ha in BRRIdhan 47 whereas Binadhan -8 showed slightly less grain yield 6.61 t/ha (on an average).
- Training on wheat cultivation and seed preservation were given to 70 SAAO of DAE personnel and 70 farmers 2 batches at Fakirhat, Bagerhat.
- Four field days were arranged at Fakirhat, Bagerhat where 520 farmers, extension personnel attended.

Bangladesh Agricultural Development Corporation

Two metric ton of the rice variety BRRIdhan-29 (Boro TLS Seed) was produced at BADC Farm, Modhupur. Ninety contract farmers were provided training on seed production technology.

2. Collection, Characterization and Utilization of Rice, Minor Cereals and Chilli in Bangladesh (AFACI)

Crop improvement as well as food security depends to a great extent on the conservation of the existing crop genetic resources and their sustainable utilization. Lack of proper strategies for national plant genetic resource conservation and adequate trained human resources are the major constraints in managing plant genetic resources of the country. Therefore, this project initiative has been initiated for collection, characterization, conservation, utilization and regeneration of rice, chilli and some minor cereals in Bangladesh under the financial and technical assistance of AFACI. The project started in January 2012 and will be completed 31st December 2014. Bangladesh Agricultural Research Council (BARC), the apex body of the National Agricultural Research System (NARS) is coordinating the project. Two major National Agricultural Research Institutes viz., Bangladesh Agricultural Research Institute (BARI) and Bangladesh Rice Research Institute (BRRI) are working as implementing institutes.

Plant Genetic Centre (PGRC), BARI collected 136 chilli and 4 minor cereals germplasm from hill districts. A total of 8 districts have been covered so far. Genetic Resources and Seed Division (GRS), BRRI team has collected 40 rice germplasm (Aus-1, Boro-3, B. Aman-1 and Jhum-35) from Barisal (coastal) and Bandarban.

Characterization of the collected germplasm is going on and would be multiplied in the next season.

3. Development and Up Scaling of Integrated Pest Management Technologies in Vegetable Crops (SPGR)

Bangladesh Agricultural Research Council (BARC) is coordinating the project at which Bangladesh Agricultural Research Institute (BARI) and Bangladesh Institute of Nuclear Agriculture (BINA) are two implementing institutes. The study was conducted in four regions viz., Jessore, Bogra, Mymensingh and Narshingdi. BARI and BINA conducted field experiments incorporating farm level up-scaling studies on the existing IPM technologies and field research studies for development of new IPM technologies.

On station and on-farm field research activities for the development of IPM technologies in vegetable crops at BARI

During July 2011 – June 2012, some noteworthy research and field validation studies were completed. During this period, BARI completed 5 on-station trials and BARI and BINA have developed pest management technologies of vegetable crops such as brinjal, cucurbits, cabbage and beans.

On-station trials

Four experiments were conducted on the insect pests and diseases of different vegetables which are described below.

i) Development of bio-rational based integrated management package(s) against fruit fly attacking bitter gourd

This study was done at the research field of BARI, Gazipur during February 2012 to June 2012 cropping season. The treatments were: T_1 = Pheromone trapping + Bio-control agent release; T_2 = Pheromone trapping + Bio-control agent release + spraying Spinosad 45SC; T_3 = Pheromone trapping + Bio-control agent release + Spraying of protein hydrolyses; T_4 = Pheromone trapping + MSG trapping + Bio-control agent release; T_5 = Spraying of Shobicron 425 EC; T_6 = Spraying Protein hydrolyses; T_7 = Untreated control. It is revealed from the Table 1 that percent fruit infestation by fruit fly was significantly less in treatments T_1 to T_4 . Percent fruit infestation was very high in the insecticide and sole protein hydrolysis treated plots (although significantly less than untreated control). Fruit fly also affected the yields of healthy fruits. Higher fruit yield was recorded from the treatment T_4 followed by T_1 , T_3 and T_2 . Healthy fruits yield was lowest in the untreated control plots followed by insecticide (Shobicron 425 EC) and protein hydrolysis treated plots. It can be concluded that the use of pheromone bait + release of bio-control agents + use of mashed sweet gourd trap is the effective

means for the management of fruit fly complex in cucurbit crops (bitter gourd) than the popularly used use of pheromone bait + release of bio-control agents treatments.

Table 1. Effectiveness of different treatments on percent fruit fly infestation and yield of bitter gourd at experimental field, BARI, Gazipur.

Treatments	% fruit infestation by fruit fly	Yield of healthy fruits (t/ha)
T_1 = (pheromone + biocontrol)	9.6±0.6 a	15.62±0.3 d
T_2 = (pheromone + biocontrol + Spinosad)	8.40±0.7 a	16.84±0.2 d
T_3 = (pheromone + biocontrol + protein hydrolysis)	8.82±0.4 a	16.13±0.3 d
T_4 = (pheromone + biocontrol + MSG trap)	6.42±0.3 a	18.15±0.2 cd
T_5 = (spraying of Shobicron 425 EC)	42.5±2.9 b	10.74±0.2 b
T_6 = (spraying of protein hydrolysis)	40.58±1.7 b	11.59±0.2 b
T_7 = (untreated control)	68.22±2.9 c	6.86±0.3 a

ii) Development of IPM packages for insect pests of tomato

There were two treatments: 1) IPM trials comprises of transplanting of ToLCV and whitefly resistant line TLB 182, hand picking of infested fruits, weekly release of egg parasitoid, *Tricogramma evanescence* (@ 1 gm parasitised eggs/ha/week) and larval parasitoid *Bracon hebetor* (800-1000 adult /ha/week) & Use of *Helicoverpa* pheromone trap (at 10m² distance), 2) Farmers' practice – transplanting of BARI tomato 2 and spraying of synthetic parathyroid insecticide (Cymbush 10 EC @ 1 ml per liter of water) at every three days interval.

Results showed that the percent borer infestation in the IPM plots was significantly lower than the sprayed plots (Table 2). Virus infested plants in the IPM plots was 29.2%, while it was 78.3% in the non-IPM plots. On the other hand during initial crop stage virus infestation was very less in the TLB 182 (in IPM plots) than BARI tomato 2 (in non-IPM plots). The Number of whitefly/leaf was also significantly lower in the IPM plots than the non-IPM plots. The yields of healthy tomato in the IPM plots were significantly higher (1.57 times higher) than the non-IPM plots.

Table 2. Insect pest and disease infestation in tomato in IPM and non-IPM plots during 2011-12 cropping season

Treatments	Pest infestation			Yield (t/ha)	Pest management cost/ha/season
	% borer infestation	No. of whitefly / leaf	% Virus infested plants		
IPM package	4.5±0.7 b	0.9±0.2b	29.2±1.7 b	49.8±0.4 b	10,000/00
Non-IPM (Spraying insecticide only)	11.2±1.2a	1.9±0.6a	78.3±2.5 a	31.7±0.6 a	22,000/00

± Standard error (SE); Means followed by the same letter did not differ significantly by paired t-test ($p < 0.01$)

iii) Development of virus resistant okra varieties and management of borer and sucking pests of okra

Studies were undertaken during summer 2012 in the experimental field of Entomology Division, BARI, Gazipur. Four genotypes/varieties were screened out against OYVMV and OSFB, jassid and whitefly. Results of the present study are presented in Tables 3 and 4. Table 3 indicated that the lowest percent fruit infestation by OSFB, number of jassid and whitefly/ 5 leaves were significantly less in BARIento 01. On the other hand, BARI Dharos 1 suffered highest insect pest attacks followed by BARIento 03.

Table 3. Response of okra germplasm/variety to the infestation of different insect pests during kharif season 2012

Okra varieties/lines	Fruit infestation by OSFB (%)	Number of jassid /5 leaves	Number of whitefly /5 leaves
BARI Dharos 1	6.4 c	9.6 d	4.7 c
BARIento 01	2.3 a	5.3 a	1.1 a
BARIento 03	5.8 bc	7.4 c	4.2 c
BARIento 04	4.6 b	6.9 b	3.6 b

It is revealed from the Table 4 that BARI Dharos 1 was susceptible to OYVMV. However, the okra line, BARIento 01 showed moderate level of resistance against OYVMV offering the lowest virus infection (14.1%). In contrast, BARIento 04 exhibited highly susceptible reaction to OYVMV offering 76.1% virus infected plants, While BARIento 03 and BARI Dharos 1 was found susceptible to OYVMV offering 57.2% and 65.5% virus infected plants, respectively.

Table 4. Response of okra germplasm/variety to yellow vein mosaic virus (OYVMV) under natural condition at BARI, Gazipur during kharif, 2012.

Varieties/lines	Virus infection/ plant (%)	Severity rating	Level of resistance	Fruit yield (t/ha)
BARI Dharos 1	65.5b	4	Susceptible	On-going
BARIento 01	14.1a	2	Moderately resistant	On-going
BARIento 03	57.2b	4	Susceptible	On-going
BARIento 04	76.1c	5	Highly susceptible	On-going

iv) Development of a management approach against the pod borer attacking yard long bean

The experiment was carried out during summer 2011 at Regional Agricultural Research Station, Jessore to develop the effective management approaches for the controlling pod borer of yard long bean. The bio-control agents such as *Bracon habetor* and *Trichogramma* sp. were released at 14 days intervals. Five treatments were: IPM Package 1 = Hand collection and destruction of larvae + Sequential release of Bio-control agent at 14 days intervals; IPM Package 2 = Hand collection and destruction of larvae + Sequential release of Bio-control agent + Spraying of bio-pesticide Spinosad (Traser) 45 SC @ 0.4 ml/L of water at 7 days intervals; IPM Package 3 = Hand collection and destruction of larvae + Sequential release of Bio-control agent + Spraying of bio-pesticide Bt @ 4 g/L of water at 7 days intervals; Farmers' practices = Spraying of Ripcord (Cypermethrin) 10 EC @ 1 ml/L of water at weekly interval, and Untreated Control.

The highest infested pod (18.75 %) was found in untreated control while the lowest (4.12 %) was obtained from IPM package 2 treated plots. The reduction of pod infestation over untreated control ranged from 44.05 – 78.02 % among the treatments. The maximum reduction of pod infestation (78.02 %) was recorded from IPM package 2 followed by IPM package 3, IPM package 1 and Farmers practices treated plots, respectively. The reduction of pod damage 1.77 times higher in farmers practices than that of IPM package 2. The natural enemy viz., Ladybird beetle and Spider were observed in the plots. The number of Ladybird beetle ranged from 0.33 to 3.00. The highest number of lady bird beetle was recorded in IPM package 1 which followed by untreated control and IPM package 2 treated plots respectively. On the other hand, the lowest lady bird beetle was found in farmers' practices plots. The number of spider did not significantly different among the treatments. The pod yield ranged from 14.46 to 25.84 t/ha which significantly different among the treatments. The highest pod yield was obtained from IPM package 2 treated plots while the lowest was recorded in untreated control plots. The pod yield 1.78 times higher in IPM package 2 than of untreated control which as recorded the lowest. From the

above results it may be concluded that the IPM package 2 was more effective against pod borer of yard long bean in respect of reducing pod infestation and higher pod yield.

Table 5. Effect of some management approach on the incidence of pod borer of yard long bean at RARS, Jessore during 2011 cropping season

Treatments	Pod infestation (%)	Reduction of pod infestation over control (%)	Natural enemy population (No.)		Pod yield (t/ha)
			Lady bird beetle	Spider	
IPM package 1	7.27	61.22	3.00	2.00	19.44
IPM package 2	4.12	78.02	2.00	1.66	25.84
IPM package 3	6.87	63.36	1.33	1.33	21.71
Farmers Practices	10.49	44.05	0.33	0.66	21.17
Untreated control	18.75	-	2.33	1.33	14.46
CV (%)	9.98	-	46.48	52.16	8.69
LSD (0.05)	1.785	-	1.575	NS	3.360

The experiment was conducted in the research field of BARI, Gazipur during summer 2011. The treatments were: T_1 = IPM package comprises of sanitation i.e. hand picking of infested pod and flowers + weekly release of bio-control agent *Trichogramma evanescens* @ 1gm/ha and *Bracon habetor* @ 1 jar (800-1200adults)/ha + 2 sprays of Spinosad 45 SC @ 0.4 ml/litre of water at fortnightly interval starting from the initiation of the pest attack; T_2 = Non IPM or Farmers practice comprises of spraying of Voliam flexi 300 SC @ 0.5 ml/litre of water; altogether 8 sprays were done starting from the initiation of the pest attack at weekly interval; & T_3 = Untreated control.

As indicated in table 6, the IPM plots showed significantly the lowest pod borer infestation (8.71%) followed by Non IPM (farmers practice) plots (20.72%). The control treatment received highest pod borer infestation (45.02%). Similarly, the highest percent pod infestation reduction (80.65) over control was achieved from IPM plots, while it was only 58.42% in non-IPM plots. IPM plots (T_1) produced significantly the highest yield (15.37 t/ha) followed by farmers practice (12.45 t/ha). However, the control treatment (T_3) provided significantly the lowest yield (6.52 t/ha).

Table 6. Treatment wise percent borer infestation and yield of yard long bean at BARI experimental field Gazipur, during 2011 cropping season.

Treatments	Pod infestation by borer (%)	Pod infestation reduction over control (%)	Yield (t/ha)
IPM	8.71 c	80.65	15.37a
Non IPM (Farmers' practice)	20.72 b	58.42	12.45b
Control	45.02 a	-	6.52c
CV%	7.15		8.56

Benefit cost analysis

The benefit-cost ratio (BCR) as worked out based on the expenses incurred and value of crops obtained from the

treated plots for the control of pod borer of yard long bean is given in Table 7. It is noted here that expenses incurred referred to those only on pest control. It is revealed that the highest benefit-cost ratio (5.19) was calculated from IPM plots followed by non-IPM (2.50) plots. Considering BCR, sanitation along with bio-control agent release and bio-pesticide spray as in IPM package may be recommended for effective management of pod borer attacking yard long bean.

Table 7. Benefit cost analysis after application of different management options for the control of Yard long bean pod borer

Treatments	Marketable yield (t/ha)	¹ Gross return (Tk/ha)	² Cost of treatment (Tk/ha)	Net return (Tk/ha)	Adjusted Net return (Tk/ha)	Benefit/Cost Ratio (BCR)
IPM	15.37	230550	21440	209110	111310	5.19
Non IPM	12.45	186750	25380	161370	63570	2.50
Control	6.52	97800	0	127800	0	-

¹Farmgate price of yard long bean @ Tk. 15.00 per kg

²[Cost of biocontrol agents: *Bracon* @ Tk 150/jar; *Trichogramma* @ Tk 100/gm; Cost of Bio-control agent release: One laborer/ha @ Tk 180.00/labour/day; Cost of Spinosad 45SC: @ Tk 2400/100ml; Cost of Voliam flexi: @ Tk 315/50 ml; Cost of spray: Two laborers/spray/ha @ Tk 180.00/labour/day; Cost of hand picking: Two laborers/ha @ Tk 180.00/labour/day; Spray volume required: 750L /ha].

v) Development of bio-rational based integrated management package(s) against fruit fly attacking bitter gourd

This study was conducted at the research field of BARI, Gazipur during February 2012 to June 2012 cropping season. The treatments were: T_1 = Pheromone trapping + Bio-control agent release; T_2 = Pheromone trapping + Bio-control agent release + spraying Spinosad 45SC; T_3 = Pheromone trapping + Bio-control agent release + Spraying of protein hydrolyses; T_4 = Pheromone trapping + MSG trapping + Bio-control agent release; T_5 = Spraying of Shobicron 425 EC; T_6 = Spraying Protein hydrolyses; T_7 = Untreated control. It is revealed from the Table 8 that percent fruit infestation by fruit fly was significantly less in the treatments T_1 to T_4 (T_1 = pheromone + biocontrol, T_2 = pheromone + biocontrol + spinosad, T_3 = pheromone + biocontrol + protein hydrolysis & T_4 = pheromone + biocontrol + MSG trap).

Percent fruit infestation was very high in the insecticide treated and sole protein hydrolysis treated plots (although significantly less than untreated control). Fruit infestation by fruit fly also affected the yields of healthy fruits. Significantly highest yield of healthy fruits were recorded from the treatment, T_4 = pheromone + biocontrol + MSG trap followed by T_1 , T_3 and T_2 .

Healthy fruits yield was lowest in untreated control plots followed by insecticide (Shobicon 425 EC) and protein hydrolysis treated plots. It can be concluded that the use of pheromone bait + release of bio-control agents + use of mashed sweet gourd trap is the effective method for the management of fruit fly of bitter gourd than pheromone bait + release of bio-control agents.

Table 8. Effectiveness of different treatments on percent fruit fly infestation and yield of bitter gourd at experimental field, BARI, Gazipur

Treatments	Fruit infestation by fruit fly (%)	Yield of healthy fruits (t/ha)
T ₁ = (pheromone + biocontrol)	9.6±0.6 a	15.62±0.3 d
T ₂ = (pheromone + biocontrol + Spinosad)	8.40±0.7 a	16.84±0.2 d
T ₃ = (pheromone + biocontrol + protein hydrolysis)	8.82±0.4 a	16.13±0.3 d
T ₄ = (pheromone + biocontrol + MSG trap)	6.42±0.3 a	18.15±0.2 cd
T ₅ = (spraying of Shobicon 425 EC)	42.5±2.9 b	10.74±0.3 b
T ₆ = (spraying of protein hydrolysis)	40.58±1.7 b	11.59±0.2 b
T ₇ = (untreated control)	68.22±2.9 c	6.86±0.3 a

On-Farm Trials

i) Development of borer complex attacking early summer tomato at northern region of Bangladesh

Studies were carried out at the farmers' field of Tunirhat, Sarkerpara, Panchagarh during the cropping season of 2011-12 for evaluating IPM package against fruit borers of early summer tomato. There were two treatments viz. T₁ = IPM package comprises of weekly release of egg parasitoid *Tricogramma evanescence* (@ 1 gm parasitized eggs/ha/week) and larval parasitoid *Bracon hebetor* (800-1000 adult/ha/week) + Use of *H. armigera* and *S. litura* pheromone trap (set at 15 m² distance), T₂ = Farmers practice (spraying of Proclaim 5SG @ 1.5 ml/liter of water at 4 days interval, total sprayed done 8 times). The results indicated encouraging performance of IPM package to reduce tomato fruit borers on tomato (Table 10). The lowest fruit infestation by number and weight was obtained from the IPM plots whereas the highest was recorded in non IPM plots. The infestation status of IPM and non IPM plots was reflected in the yield. Higher yield was obtained from IPM plots (39.90 t/ha) than non IPM plots (30.48 t/ha). However, among the borers, *S. litura* was the predominant species at that location (higher number of *S. litura* captured in the pheromone trap than *H. armigera* pheromone trap).

Table 9. Efficacy of IPM package against fruit borers of tomato at the farmers' field of Danakata, Bodha, Panchagarh

Treatments	Fruit infestation (% by number)	Fruit infestation (% by weight)	Number fruit borers captured/ trap		Fruit yield (t/ha)
			<i>S. litura</i>	<i>H. armigera</i>	
IPM	4.81	4.56	64.5	2.16	39.90
Non- IPM	18.94	18.35	-	-	30.48
t-value	18.35**	19.15**	-	-	7.66**

ii) Management of *Spodoptera litura* attacking aroids

The trial was carried out at the farmer's established aroid (local var. panikachu) field at Joypurhat. There were two treatments: T₁ = Setting of sex pheromone trap of *S. litura* after two weeks of aroid transplantation and weekly release of egg parasitoid *Tricogramma evanescence* (@ 1 gm parasitized eggs/ha/week) and larval parasitoid *Bracon hebetor* (800-1000 adult/ha/week), T₂ = Farmers practice (application of insecticide: Morte 48 EC (Chlorpyrifos) @ 2ml/L of water, 10 times spray at 7 days interval. The lowest no of larvae/leaf (0.98/10 leaf), percent of infested leaf (2.29), percent of infested stolon by no (1.2%) & wt (1.13%) and highest yield of stolon (20.07 t/ha) & rhizome (22.91 t/ha) was obtained from IPM package treated plots compared to farmers practice (Table 11). Higher gross return (Tk. 3,90,650/ha) and gross margin (Tk. 3,88,150/ha) was also recorded from the treatment (Table 12). No of captured insect/trap was 19.01 in IPM treatments. Number of captured adult increased with the increase of plant age and reached peak at the middle of the season and thereafter population decreased with the progress of the season.

iv) IPM packages against leaf eating caterpillars of cabbage and cauliflower

This study was undertaken at the farmers' field of Jessore (Churamonkati, Sadar upazilla), Narshingdi (Belabo and Shibpur upazilla), Chittagong (Mirshorai), Sherpur (Nakla), Bogra (Sherpur) during October 2011 to March 2012. Treatments were 1) IPM trials comprises of pheromone trapping of *Spodoptera litura* starting after the transplantation of seedling along with weekly release of egg parasitoid, *Tricogramma evanescence* (@ 1 gm parasitised eggs/ha/week) and larval parasitoid *Bracon hebetor* (800-1000 adult /ha/week) and 2) Farmers' practice (Non-IPM) – spraying of Voliam Flexi or Proclaim at 3 days interval. At different locations 80.5-92.7% less head infestation in the IPM plots was recorded resulting in 24.1-39.1% higher head yield than the farmers' practice (Table 14). Same trends were also observed in cauliflower. At different locations 79.7-97.6% less head infestation in the IPM plots was recorded resulted in 17.5-43.2% higher yield than the farmers' practice (Table 15).

Table 10. Effect of pheromone trap based IPM approach against common cutworm in Aroid at the MLT site, Joypurhat

Treat-ment	No of larvae /10 leaf	Infested leaf (%)	No of Healthy Stolon /ha	No of Infested Stolon/ha	Infested stolon (%) (by no)	Infested stolon (%) (by wt)	Yield of Healthy Stolon (t/ha)	Yield of Rhizome (t/ha)	No of insect captured/trap
IPM	0.88	2.34	4,56,240	5995	1.2	1.13	20.7	22.9	19.01
Non- IPM	1.79	10.79	3,45,941	21,093	5.74	6.28	16.4	21.31	
't' value	6.96**	12.16**	97.83**	88.38**	10.73**	9.31**	6.62**	4.58**	

Table 11. Cost and return analysis of Aroid in different management approach at the MLT site in Joypurhat

Treatment	Gross return (Tk/ha)			Cost of pest management (Tk/ha)	Gross margin (Tk/ha)
	Stolon	Rhizome	Total		
IPM	310500	80150	390650	2500	3,88,150.00
Non- IPM	246000	74585	320585	17050	3,03,535.00

iii) Management of shoot and fruit borer, *Leucinodes orbonalis* attacking brinjal

There were two treatments viz., T₁ (IPM package) = Comprised of Sanitation, use of Synthetic Pheromone together with Sanitation and weekly release of egg parasitoid, *Trichogramma evanescence* (@ 1 gm parasitized eggs), larval parasitoid, *Bracon habetor* (@ 1000-1200 adults); and T₂ = Farmers'

practice (Spraying of insecticide only at 2/3 days interval). The results of pheromone mass trapping at different regions were very much encouraging. Irrespective of locations, IPM package reduced shoot infestation by 38.7-72.1% and fruit infestation by 39.2-61.6% over farmers' practice. On the other hand, 18.2-33.8% yield of healthy brinjal in IPM plots were increased over the non IPM plots (Table 13).

Table 12. IPM package against brinjal fruit and shoot borer in brinjal at Mymensingh, Bogra, Jessore, Narshingdi and Chittagong regions during summer 2011 and winter 2011-12

Treatment	Shoot infestation (%)	Shoot infestation reduction (%)	Fruit infestation (%)	Fruit infestation reduction (%)	Fruit yield (t/h)	Fruit yield increase (%)
Gaforgaon Upazilla, Mymensingh						
IPM	8.5	51.9	7.1	61.1	50.1	31.3
Non-IPM	17.7	-	18.3	-	34.5	-
Nakla Upazilla, Sherpur						
IPM	2.7	71.8	10.2	52.1	42.8	24.5
Non-IPM	9.6	-	21.3	-	32.3	-
Nurundi Upazilla, Jamalpur						
IPM	4.7	58.4	8.7	39.2	45.4	27.9
Non-IPM	11.3	-	14.3	-	32.7	-
Sherpur Upazilla, Bogra						
IPM	20.1	48.1	22.2	35.7	19.7	30.1
Non-IPM	38.7	-	34.6	-	15.2	-
Sadar upazilla, Jessore						
IPM	4.2	49.3	5.8	59.1	32.8	32.3
Non-IPM	8.3	-	14.3	-	22.2	-
Belabo Upazilla, Narshingdi						
IPM	8.7	38.7	7.4	43.5	42.4	18.2
Non-IPM	14.2	-	13.1	-	34.7	-
Shibpur Upazilla, Narshingdi						
IPM	3.8	72.1	4.3	61.6	54.3	26.7
Non-IPM	13.6	-	11.2	-	39.8	-
Mirshari Upazilla, Chittagong						
IPM	6.8	61.3	5.3	59.8	44.7	33.8
Non-IPM	17.6	-	13.2	-	29.6	-

Table 13. Effect of different treatments on the management of leaf eating caterpillar of cabbage at different locations

Treatments	Head infestation (%)	Reduction of head infestation over non IPM plots (%)	Head yield (t/ha)	Head yield increase over non IPM plots (%)
Shibpur Upazilla, Narshingdi				
IPM plot	0.6 a	92.7	36.9 a	24.7
Non-IPM plot	8.3 b	-	29.6 b	-
Belabo Upazilla, Narshingdi				
IPM plot	0.7 a	90.2	39.0 a	23.1
Non-IPM plot	7.2 b	-	31.7 b	-
Sadar Upazilla, Jessore				
IPM plot	1.4 a	80.5	56.5 a	33.5
Non-IPM plot	7.2 b	-	42.3 b	-
Mirershorai, Chittagong				
IPM plot	2.3 a	84.1	51.2 a	39.1
Non-IPM plot	14.5 b	-	36.8 b	-
Nakla Upazilla, Sherpur				
IPM plot	3.2 a	83.1	55.4 a	30.2
Non-IPM plot	18.6 b	-	39.2 b	-
Sherpur Upazilla, Bogra				
IPM plot	2.1 a	86.2	55.2 a	24.1
Non-IPM plot	15.1 b	-	44.5 b	-

Table 14. Effect of different treatments on the management of leaf eating caterpillar of cauliflower at different locations

Treatments	Head infestation (%)	Reduction of head infestation over non IPM plots (%)	Curd yield (t/ha)	Curd yield increase over non IPM plots (%)
Shibpur Upazilla, Narshingdi				
IPM plot	1.6 a	79.7	34.9 b	17.5
Non-IPM plot	7.9 b	-	29.7 a	-
Belabo Upazilla, Narshingdi				
IPM plot	1.2 a	85.5	38.3 b	28.5
Non-IPM plot	8.3 b	-	29.8 a	-
Sadar Upazilla, Jessore				
IPM plot	0.2 a	97.6	58.4 b	33.3
Non-IPM plot	8.6 b	-	43.8 a	-
Mirershorai Upazilla, Chittagong				
IPM plot	1.3 a	91.7	49.8 b	27.1
Non-IPM plot	15.6 b	-	39.2 a	-
Nakla Upazilla, Sherpur				
IPM plot	3.5 a	86.3	59.9 b	43.2
Non-IPM plot	25.6 b	-	34.5 a	-

v) IPM packages against borer pest complex and aphid of country bean

This study was undertaken at the farmers' field of Jessore (Satmail, Sadar upazilla) and Narshingdi (Belabo upazilla) during September 2011 to March 2012. Treatments were 1) IPM trials comprised of hand picking of infested flowers and fruits at alternate days and weekly release of egg parasitoid, *Tricogramma evanescens* (@ 1 gm parasitized eggs/ha/week) and larval parasitoid *Bracon hebetor* (800-1000 adult /ha/week) and spraying of soap water (5 gm/liter of water) during initial aphid infestation along with two

spraying of bio-pesticide Spinosad (Tracer 45 SC @ 0.4 ml/liter of water), and 2) Farmers' practice (Non IPM) – spraying of Voliam Flexi 300 SC or Proclaim 5 SG at 3 days interval). At Jessore 65.7% less pod infestation in the IPM plots with 34.6% higher pod yield was obtained, while at Narshingdi, 82.8% less pod infestation in the IPM plots with 43.8% higher pod yield was recorded (Table 16).

Table 15. Effect of different treatments on the management of pod borer complex at different locations

Treatments	Flower infestation (%)	Pod infestation (%)	Reduction of pod infestation over non IPM plots (%)	Pod yield (t/ha)	Yield increase over non IPM plots (%)
Satmail, Sadar, Jessore					
IPM plot	0.5 a	3.5 a	65.7	24.5 b	34.6
Non IPM plot	3.0 b	10.2 b	-	18.2 a	-
Belabo, Narshingdi					
IPM plot	1.8 a	2.6 a	82.8	27.9 b	43.8
Non IPM plot	4.2 b	14.2 b	-	19.4 a	-

Monitoring of Programme/ activities

Scientist of Crops Division took part along with other scientists of BARC as monitoring team member for field monitoring of SPGR sub-projects of BARC during 2011-12. The teams visited BSRI, BARI and BRRI and monitored seven SPGR sub-projects, 1) Genetic Enhancement of Sugarcane for Sustainable Productivity through Tissue Culture and Molecular Marker Techniques, 2) Utilization and Management of Sugarcane Mills Effluent Water for Irrigation Purposes to Increase Crop Production, 3) Development and Utilization of Bangladesh Rice Knowledge Bank (BRKB), 4) Identification of existing races of

Pyricularia grisea and gene pyramiding for durable blast resistance in rice, 5) Identification and Utilization of QTLs from Rice Wild Relatives for High Yield through Use of Microsatellite Markers, 6) Studies on the Impact of Climate Change on Fungal Disease of Crops, 7) Livelihood Improvement of Farming Community in Haor Area through System Approach. The monitoring reports of the above projects were presented at BARC during 9-10 May, 2012. A total of 32 SPGR sub-projects under Crops Division are being implemented by NARS institutes and universities. All these projects are being monitored at field and desk level by the scientists of Crops Division, BARC.

4. Farming System Research and Development for Farmers' Livelihoods Improvement

Bangladesh Agricultural Research Council (BARC) is coordinating the project entitled "Coordinated Sub-Project on Farming System Research and Development for Farmers' Livelihoods Improvement" with financial assistance by SPGR under NATP (National Technology Transfer Project). The implementing institutes of the project are Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Bangladesh Jute Research Institute (BJRI), Bangladesh Sugarcane Research Institute (BSRI), Bangladesh Institute of Nuclear Agriculture (BINA), Bangladesh Livestock Research Institute (BLRI), Bangladesh Fisheries Research Institute (BFRI), Bangladesh Forest Research Institute (BFRI), Bangladesh Agricultural University (BAU). The main objective of the project was to upscale and testing of whole farming technologies to improve the skill of the scientists/extension personnel in relation to FSRD. The project was started in February, 2012. Some preliminary works have been done under the project until June 2012. An inception workshop was held on 13 June 2012 in BARC. Important suggestions/comments made are given below:

- All PIs should take initiative immediately to select new areas (1 to 2 villages) at the farming system site.
- Uniform bench mark survey format should be followed supplied by BARC
- Recent technologies developed by NARS institutes should be included in the production trials.
- Large scale production program with promising/ viable variety and improved packages should be conducted.
- Local working group may be constituted involving DAE, DoF and DoL personnel. Farmers' selection should be done in cooperation with the DAE personnel.
- Small horticultural gardens may be established with improved fruit varieties in Sylhet area or any other suitable areas.
- Value chain/market system development to be ensured.

5. Coordinated Sub-Project on Characterization of Important Plant Genetic Resources

Bangladesh Agricultural Research Council (BARC) is coordinating the project entitled "Coordinated Sub-Project on Characterization of Important Plant Genetic Resources" under NATP (National Technology Transfer Project). The implementing institutes of the project are Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Bangladesh Jute Research Institute (BJRI), Bangladesh Sugarcane Research Institute (BSRI), Bangladesh Institute of Nuclear Agriculture (BINA) and Bangladesh Agricultural University (BAU). The main objective of the project is to characterize the released varieties, landraces and Geographical Indications (GI) of some crops using morpho-agronomic and molecular methods. The project has been started 27 December 2011. Some preliminary works have been done by respective institute under the project are given below:

BRRI: Morphological characterization of 51 land races of Aus rice.

BJRI: Morphological characterization of 12 varieties of white jute, tossa, kenaf and mesta jute as well as 50 germplasm of white jute.

BINA: Morphological characterization of 32 mungbean germplasm and 6 chickpea varieties and molecular characterization of 22 lentil genotypes.

BAU: Morphological characterization of 2 GI crops (guava and jujube) and some BAU released fruit varieties

Technology Transfer Monitoring Unit

Policy Level Contribution

Divisional officers' were participated different policy level meeting, seminar, workshop and given their valuable comments. Different policy oriented comments were also sent to the Ministry of Agriculture according to their needs/ requirements.

Project Development/Management and Financing

Director, (TTMU) has been working as Project Director of PIU-BARC of National Agricultural Technology Project.

Director has also been working as Associate Coordinator in coordinated sub project on " Farming Systems Research and Development for Farmers' Livelihoods Improvement".

Monitoring, reviewing and evaluation report of programs/activities of NARS Institutes

SPGR Field Monitoring

1. "Research and technology generation in lac (লাক্ষা) as a means towards elevation of productivity and income of the and marginal farmers". reject Chapai Nawabganj" from 02/12/2012 to 04/12/2012

2. "Coordinated Project on Improvement of Agro-forestry Practices for Better Livelihood and Environment: BFRI (Forest) Component on 02/01/2012
3. "Coordinated Project on Improvement of Agro-forestry Practices for Better Livelihood and Environment (CU) Component" on 03/01/2012
4. "Assessment of Post-harvest Losses and Improvement of Post-harvest Practices of Major Fruits and Vegetables of Bangladesh" at BARI, Gazipur on 25/01/2012
5. "Coordinated Project on Improvement of Agro-forestry Practices for Better Livelihood and Environment (BAU) Component" in Mymensingh on 25/01/2012
6. "Coordinated Project on Improvement of Agro-forestry Practices for Better Livelihood and Environment (BSMRAU) Component" in Kapasia and Narshingdi on 26/01/2012

Core Research Field Monitoring

1. "Development of short duration high yielding rice variety through induced mutation" at Satkhira and Magura on 27/03/2012
3. "Up scaling of summer onion bulb and seed production technology at farmers level at Rajbari and Faridpur on 28/03/2012
4. "Organic amendmends for upland crops under light textured soils in Char" at
5. Faridpur on 28/03/2012

Participation in the Training, Workshop, Seminar, Training-workshop etc (Local):

All personals attended in many Trainings, Workshops, Seminars, Training-workshops etc (Local) organized by different organizations.

PLANNING AND EVALUATION

A. Project Implementation/Project Financing

The Project Implementation Unit (PIU) of Bangladesh Agricultural Research Council (BARC) is implementing the research component of National Agricultural Technology Project (NATP). This component is coordinated by the Planning & Evaluation Division. A total of 102 Sponsored Public Goods Research (SPGR) sub-projects in selected identified thematic areas are being implemented at different NARS institutes and public universities of the country.

A seven member Proposal Evaluation Committee (PEC) under the provision of Public Procurement Regulations 2008 was formed with Dr. Meraz Uddin Ahmed, Member-Director (Administration and Finance) as Chairperson. Among others Sk. Ghulam Hussain, Member Director as a member and Dr. Paresh Chandra

Golder as the member-secretary made major contributions in recruiting the National Core and Short-term Consultants and International Consultants for the NATP Phase-I.

B. Research Management and Coordination

To facilitate research and technology transfer activities the Bangladesh Agricultural Research Council is providing research grants to various public organizations since 2004. During the fiscal year 2011-12 the Planning and Evaluation coordinated the research and development programmes of the NARS, and Agricultural universities through funding of the core research, technology transfer and human resource development. Further, the Planning and Evaluation division organized frequent review and desk/field monitoring, for its success.

With the approval of the Executive Council of BARC an amount of Taka 112.78 lakhs was provided to the core research and technology transfer programmes.

Findings of the implemented projects through different organizations are briefly described below:

Core Research

Bangladesh Agricultural Research Institute

1. Integrated Management of Banana Diseases Incited by Fungi and Nematode

Although the project on "Integrated Management of Banana Diseases Incited by Fungi and Nematode" approved by BARC from July, 2011 but the project activity was started from November 2011 with survey of panama disease. Three popular banana growing areas such as Mithapukur (Rangpur), Sibganj (Bogra) and Pirojpur sadar were surveyed for panama in December-January period where the disease incidence was found 7.2, 6.3 and 13.0% respectively. The infestation of other diseases like sigatoka, bunchy top and mosaic was also found low during the surveyed period. The collected pathogen of panama was purified and stored for future use.

2. Evaluation of Short Duration High Yielding Rapeseed- Mustard Varieties/Lines for Cultivation Between T.Aman And Boro Rice

The experiment was conducted at RARS, Jamalpur during Rabi 2011-2012 with 20 varieties/lines of *Brassica campestris* in set-1 and 20 varieties/lines of *Brassica napus* in set-2. Evaluation of these varieties/lines and selection of the best one(s) short duration high yielding was the main aim of the study. The lines BC-0810, BC-08-3, BC-08-1, BC-0844 and BC-11024 of *Brassica campestris* were selected on the basis of their early maturity and yield from set-1. These lines produced 15-31% higher yield than Tori-7 and 5-21% than BARISharisa 14 respectively. They also took 72-79 days to mature. Similarly, Nap-0733-1, Nap-0660, Nap-01717-2, Nap-0837, Nap-0865 and Nap-205 in set-2 produced 2-9% higher yield than BARISharisa 8 and

took 76-82 days to mature. These lines may be selected for cultivation in between T. aman and Boro rice.

3. Up Scaling of Summer Onion Bulb and Seed Production Technology at Farm Level

On-farm trial for up scaling of summer onion bulb and seed production technology was conducted under the supervision of FSRD site and MLT site of OFRD, BARI, Faridpur during *kharif-II* season of 2011 & *Kharif-I* season of 2012 for bulb production and *rabi* season of 2011-2012 for seed production with the objectives to disseminate knowledge among the selected growers about summer onion varieties and their production technologies on summer onion bulb and seed production, to develop post harvest technology. Seed production of summer onion varieties (BARI Peaj 2, BARI Peaj 3, BARI Peaj 5) was conducted at five different sites by Spices Research Sub Center, Faridpur. Two field days were arranged in *Kharif season of II* 2011 at the time of bulb maturity stage and *rabi season of* 2011-2012. In *Kharif II seasons of* 2011 summer onions were planted in seven (7) farmers' field. In *Kharif I* 2012 season, summer onion was planted in eleven (11) farmers' field. For seed production in *rabi* season, five production programme sites were selected. Results revealed that, summer onion bulb production in *kharif II* 2011 of three varieties (BARI Peaj 2, BARI Peaj 3 and BARI Peaj 5) showed reasonable yield. BARI Peaj 2 and BARI Peaj 3 showed yield of 22.66 t ha⁻¹ and 25.18 t ha⁻¹, respectively at Faridpur but at Rajbari, BARI Peaj 3 showed lower yield (9.50 t ha⁻¹). BARI Peaj 5 produced 25.92 t ha⁻¹ and 11.38 t ha⁻¹ at Faridpur and Rajbari respectively. In *kharif I* 2012, BARI Peaj 2, BARI Peaj 3 and BARI Peaj 5 showed yield of 12.27 t ha⁻¹, 10.99 t ha⁻¹ and 14.18 t ha⁻¹ respectively whereas yield at Rajbari was 11.60 t ha⁻¹, 9.73 t ha⁻¹ and 11.09 t ha⁻¹, respectively. The seed was not harvested from four plots due to climate hazard. Rest one plot (1.5 dec land) of BARI Peaj 5 gave 500 gm seed. In Rajbari and Faridpur Sadar, more farmers want to get training and planting materials (bulb and seed) of summer onion varieties due to higher yield and higher income in off season.

4. Economic Impact of Climate Change on Crop Production in Southern Zone of Bangladesh

This is a two years' project started from the year 2010-11 with the closing year 2011-12. A field survey was conducted in Patuakhali, Barguna, Bhola, Lakshmipur, Satkhira, Jhalokati, Khulna and Pirojpur districts under the AEZs 13, 14, 17 and 18 to analyze the climate scenario and the economic impact of climate changes on crop production in Southern zone of Bangladesh using the Ricardian function. Two types of lands were under the study with medium high land and medium low land those covered about 92 and 8 percent, respectively. As many as seven major crops namely Mungbean, khesari, soybean, groundnut, chili, T. aus and T. aman were found. The yearly net revenues of eight aforesaid districts were

found at taka 65836, 66924, 82827, 77875, 61359, 42011, 31191 and 24886 per hectare, respectively. Yearly average crop net revenue was obtained from 800 hundred sample farmers at Taka 56614 per hectare. A total of twelve different cropping patterns were found in the study area. Both the temperature and rainfall data were collected from Bangladesh meteorological department website for the period of 1975-2010. The mean temperature was increased to 0.75 °C within 36 years i.e. from 1975 to 2010. It is seen that the rise of 1°C temperature requires 45 years. The rainfall was decreased in Rabi and Kharif 1 season except Kharif 2. But the yearly total rainfall was increased by 0.12 percent i.e. only 70 mm from 1975 to 2010. The inverse relationship was found between temperature and rainfall. The variability of rainfall was found irregular over the season as well as over the months. The highest marginal loss was estimated at taka 3009 million due to rise in temperature. The total loss of taka 7584 million was estimated whereas per hectare loss was found at taka 6482 due to rise of annual mean temperature (°C), annual total rainfall (mm), lower flooding depth (0.30-0.91cm) and higher flooding depth (0.91-1.83cm) climatic variables in the study area.

5. Development of packages for fruits (mango, banana) and vegetables (yard long bean, pointed gourd, okra)

Pre-tested questionnaires were used to collect information on existing pre-and postharvest practices for fruits and vegetables. Again, two types of corrugated fiber box (CFB) cartoon and wooden crates have been designed and developed, and two types of plastic crates (nested and non-nested/normal crates) have been collected from the local producers. Different perforated polypropylene packets were used with these crates and cartoons to apply modified atmosphere packaging concept for conducting experiments on banana and okra. Fresh banana and okra were harvested in the farmers' field and washed with 200 ppm chlorax and 100 ppm gibberellic acid to free microbial infestation and to retain the green color, respectively. From the survey it was found that most of the traders/wholesalers use different types of packages for transporting fruits and vegetables except banana. Both the farmers and traders do not use any types of packages for transporting banana. They transport banana in open and bulk condition with the whole bunch of banana. Proper postharvest treatment and modified atmospheric packaging during transportation and storage of mature green banana viz. 'banana in 1.0% perforated polypropylene packet and then transporting in CFB cartoon' delayed the ripening process and prolonged storage life up to 20 days at 20±2 °C and 75-85% RH retaining desirable colour, texture and quality. Okra pre-treated with chlorine water and then packaging in 0.4% perforated polypropylene and transporting in plastic crates/wooden crates/CFB cartoon is the best technique for quality and shelf life for 10 days of storage at ambient

temperature considering its physical appearance, marketable quality and change of physico-chemical parameters.

6. Impact of Agricultural Cash and Kind Support System on the Rural Farm Economy of Bangladesh

The study aims to evaluate and assess the cash and kind support system, which was provided to the Boro and Aus rice farmers of Bangladesh. As these two systems are very new in Bangladesh, the contribution of these supports in rice production economy and evaluation of these system to know the performance, acceptance, efficiency factors, reform options are very essential and timely. Aiming these issues, the study has undertaken with some objectives which will provide very possibilities and constraints of the system and offer the possible options to improve these system. The study revealed that the average cash support Tk. 839 for diesel operated irrigation contributes 5% of irrigation cost and 1% of total cost in Boro rice production. The most important inefficient factors of the cash support system were late payment of money mentioned by 77% farmer and insufficient amount of money mentioned by 83% farmers. Based on the 66% of cash supported farmer's outlook, cash support system was a very good efficient system. The BCR in rice production obtained by the cash supported farmer was 1.27 and unsupported farmer was 1.26. The returns to irrigation through cash support was Tk. 1936. To make it more efficient it needs to be ensured that it is given in proper time through increasing the amount of money and number of farmers need to be increase under this support. In the year 2011-12, the government provided kind support to the Aus rice producer through giving Urea 20 kg, TSP 10 kg., and MP 10 kg. It is revealed that, 79% of farmer's experience on fertilizer support system indicated that this system offered a very good level of performance. The cost and return analysis exposed that government provided NPK fertilizer was valued at Tk 766. The value of fertilizer package was shared 16% of NPK cost, 15% of total fertilizer cost, 2.59% of total variable cash cost (WS-TVCC) and 1.47% of the Total cost (WS-TC). When the support was given the BCR (TVCC) was little higher (2.04) compare to the WS-BCR (TVCC) (1.98) achieved by the supported farmer if support would not be given. The rate of return to fertilizer was Tk. 7 and returns to supported fertilizer was Tk. 5329. To improve this system increase the amount of fertilizer, number of supporting farmer and improve farmer selection procedure to reducing biasness and unfairness is necessary. In comparison between cash support for irrigation and kind support for fertilizer, highest percentage of the sample farmer (74%) supported that direct fertilizer support was better than cash support.

7. Development and dissemination of a low cost power tiller operated potato planter

A power tiller operated cup type potato planter has been

developed at BARI Rajshahi which can plant whole tuber potato seeds as well as cut piece potato seeds in furrows at predetermined distance and earthing up simultaneously. Potato planter maintains a single row of spacing 600 mm and maintains seed to seed distance 200 mm. This planter singularizes the seed by a series of cups equally spaced that pass vertically through the secondary seed box for taking one piece of seed per cup. The planters perform four mechanical functions simultaneously, viz., opening furrow, metering the seed, and making beds along with covering the seed. Performance of the planter was evaluated to determine the effect of forward speed and seed sizes on the uniformity of spacing and seed missing during 2011-12. Four operating speeds (1.2, 2.4, 3.5 and 4.2 km/hr) and three whole tuber seed sizes (25mm, 35 mm and 45 mm) were varied to evaluate the planter. Uniformity of spacing varied with the increase of operational speed. It was found that forward speed of 2.4 km/hr is the best in respect of uniformity of spacing and missing seeds. Seed sizes of 35mm were found the best in respect of uniformity of spacing (92%) at the speed of 2.4 km/hr. Field demonstrations were conducted at Rajshahi farm. The average effective field capacity of the potato planter was 0.10 ha/hr and missing seed was 3%. The seeding depth can be adjusted within 100mm to 1250mm. Neighbouring farmers visited the potato plots and observed the potato planter's function during the potato growing season.

8. Improvement of gladiolus quality and its adaptation

To increase yield and quality of gladiolus flower per unit area and farmer's income, four experiments were conducted. Considering the important flower and corm parameters, the genotypes GL-024 and GL-017 were identified as promising. The treatment combination of GA_3 at 200 ppm and large size corm was the best performance in respect of flower production of gladiolus. The study revealed that B and Zn at the rate of $B_{2.0} Zn_{3.0}$ kg ha⁻¹ along with blanket dose of $N_{375} P_{150} K_{250} S_{20}$ kg and CD 5 t/ha⁻¹ exhibited the best performance in flower production and the vase life of flower. Both the BARI Gladiolus-1 and BARI Gladiolus -3 varieties showed better performance and produced higher yield at all location (Jessore, Gazipur and Rangpur). But the demand of BARI Gladiolus -3 was more than BARI Gladiolus -1 considering choice, early flowering and economic profitability.

Bangladesh Rice Research Institute

1. Hybrid rice technology and its sustainability at the farm level: A study on food security for farm households

The present study was undertaken in order to examine adoption rate of hybrid rice at the farm level, area shifting to hybrid rice from MVs, comparative profitability of

hybrid rice to HYVs, document consumer's preferences and constraints towards adoption of hybrid rice. Data were collected by conducting farm level survey in Favorable (Rangpur), Flood prone (Sherpur), drought prone (Rajshahi), Saline (Khulna) and tidal submergence (Barisal) etc. Tez, Alok, Jholok, Aftab, Hira-2&5, SL-8, Aloron, Sankar, Sathi, ACI 1&2, Rajkumar, Sonarbangla, Madhumoti, Bijli, Ialtir, Agomoni, Moina and Tia were found to grow in the study districts. BRRI dhan28 and BRRI dhan29 are very popular rice varieties in all study areas. BRRI dhan47 and Binadhan8 were cultivated in Barisal and Khulna, respectively. Although, the yield performance of hybrid rice and MVs was varied in different district but the yielding performance was a quite stable in all districts, respectively. However, the yield of hybrid was quite impressive than MVs. The yield of hybrid, BRRI dhan28 and 29 were on an average 7, 5 and 6 t/ha. It was found that human labour use for hybrid rice cultivation was higher (13% in Barisal, 24% in Khulna, 0.64% in Rajshahi, 8% in Rangpur and 35% in Sherpur district respectively), compared to that of MVs. Farmers used 3 or 4 times more seed of hybrid rice compared to that of MV in all study locations, but price of hybrid seed was 8 times higher than MVs. Irrigation cost of hybrid rice cultivation in all districts is relatively higher compared to that of MV rice cultivation. Unit cost of hybrid production was a bit lower compared to MVs in all districts, since its grain yield was higher (23% in Barisal, 30% Khulna, 9% in Rajshahi, 16% in Rangpur and 17% in Sherpur district). However, unit cost of production was the highest in Khulna (Tk16/kg) than all other districts. The yield of both HYVs and hybrid in Barisal was quite higher (8.6 t/ha for hybrid and 6.5 t/ha for MV), which resulted to higher gross margin, and net return in this area than all other district. BCR of hybrid (1.10) in Barisal and Rajshahi was a bit higher compared to that of MVs but it was at par with that of MV in Rangpur, Khulna and Sherpur. Mean difference in all costs and return variable like human labour, land preparation, seed, fertilizer, manure, irrigation, pesticides, gross return, variable cost, gross margin, total cost and net return per hectare of hybrid and MV rice varieties were statistically significant at 1% level. The regression results showed that the estimated co-efficient of labour cost, seed cost, fertilizer, irrigation and pesticides cost were statically significant at 5% level indicating was negatively significant at 1% and positively significant at 5% level. Similarly, the estimated co-efficient for land preparation, fertilizer, irrigation, manure and pesticides cost were statically significant at 5% level. The Tobit model that more extension access and participation in training and organizations are were positively related to the probability of continuation and intensity of hybrid rice cultivation and significant in the Tobit model at 1% and 10% level, respectively. The coefficient of farm size indicated that increasing the farm size is negatively

associated with the lower probability of hybrid rice adoption. The result indicated that family member, number of agricultural labour, farming experience, own land have no significant effect on the probability of hybrid rice adoption.

Almost all the producers showed their enthusiasm to continue growing hybrid rice only expecting better yield in the next season, while 90% mentioned that higher profit comes from higher production. Almost all hybrid growers reported that they will not cultivate hybrid rice in the next season due to higher cost of seed, lower market price and demand, low profit, not keeping seed for next season and low grain quality. Eighty nine percent of small farmers expressed that availability of rice to farm families increased 30 days when they cultivated hybrid rice. Seventy two percent of medium farmers reported same notion that rice availability increased to about 15 days more than before. Large farmers are happy to opine that rice production increased due to hybrid rice adoption but they did not use hybrid rice for home consumption. Majority of the farmers mentioned that frequent power disruption (electricity), high price of diesel and fertilizer, high price of seed and low market price of paddy are now great constraints toward hybrid rice cultivation.

Bangladesh Jute Research Institute

1. Improvement of jute based cropping pattern & jute seed production techniques in southern areas of Bangladesh.

The study has been undertaken to assess agro-economic performance of existing cropping patterns followed by farmers practice in the coastal salinity area of Kalapara and Dumki under Patuakhali district; and Amtali under Barguna district. A total of 60 farmers (taking 20 from each upazilla) were selected by adopting simple random sampling method. Data were collected through survey method by using structured questionnaire. There are seven major cropping patterns, which are generally practiced by the farmers in the study area. Among the cropping patterns, majority of the farmers practiced Fallow-T.Aman-Fallow pattern (76%) followed by T.Aus-T.Aman-Fallow (74%), T.Aus-T.Aman-Pulses (64%), Fallow-T.Aman-Pulses (55%), Fallow-T.Aman-vegetables (48%), B.Aus/T.Aus-Fallow-Chilli (29%) and Vegetables-T.Aman-Vegetables (25%). Under the experiment "Performance of jute seed production with winter vegetables in southern areas of Bangladesh", four cropping pattern were studied in this experiment like Jute seed as a sole crop (T_1), Jute seed + Lalshak + Radish (Broadcast method) (T_2), Jute seed + Lalshak + Tomato (Line sowing with three pair method) (T_3), Jute seed + Tomato + Brinjal + Palongshak (Line sowing with three pair method) (T_4). Among four cropping patterns the maximum yield of jute seed was observed from jute seed as a sole crop 543 kg/ha and 532 kg/ha in Kalapara and Amtoli respectively. The benefit cost ratio (BCR) on

full cost basis ranges from 1.06 to 1.65. Other experiments are in the field. As a result, the data collection of these experiments not yet has been completed. Four farmer trainings were conducted at Kalapara, Amtoli and Dumki with 200 farmers and three field days were conducted at Kalapara and Dumki with 130 farmers and 3 SAAO at jute seed and jute fibre maturity stage in the year 2011-12.

Bangladesh Institute of Nuclear Agriculture

1. Development of short duration high yielding boro rice varieties through induced mutation

To develop short duration, high yielding boro rice variety(s) that can be transplanted after harvest of high yielding mustard/rapeseeds and to develop boro rice variety(s) with yield potential of 8.0-8.5 t/ha, two experiments were performed. The first experiment included two mutant lines and the second experiment 10 mutant lines. In the first experiment, seeds of RM(1)-200(C)-1-1-10 and RM(1)-200(C)-1-17 along with BRRI dhan28 were sown during 5 to 18 January at 9 locations and were transplanted during 8 February to 1 March 2012. In most of the locations, transplantation was made after harvest of long duration mustard/rapeseed. In the second experiment, seedlings of 10 mutant lines along with BRRI dhan29 were transplanted on 22 January 2012 at 41 days after seed sowing at BINA farm, Mymensingh. Both these experiments followed RCB design with 3 replications. Based on the performance of nine locations, and farmer's and extension agent's opinion on the first experiment, it can be concluded that both the mutants are suitable for late transplanting after harvest of long duration mustard/rapeseed. The mutant RM (1)-200(C)-1-17 produced the highest yield at 5 locations out of nine while the other produced higher yields at three locations. Moreover, these mutants had shorter plant height, lodging resistant, erect plant and leaves, shorter duration, and similar grain quality as the check variety. Proposal will be made to National Seed Board in the next boro season for their approval as varieties with late transplanting potential after harvest of mustard/rapeseed. The mutant RM(2)-50(C)-2-1 that produced 1.35 t/ha more yield than its parent BRRI dhan29 together with five others with higher filled grains/panicle, longer panicle length, statistically at par yield and shorter maturity period would be put into advance yield trial in the next boro season.

2. Soil Water and Nitrogen Management for Sustainable Crop Production Using Tracer Technique in Drought Prone Areas of Bangladesh

An isotope aided field experiment was carried out with wheat during the year of 2011 at drought prone area, Godagari Upazilla, Rajshahi, Bangladesh. The experiment was conducted in a two factor split-plot design with 3 replications and the objective of the

experiment was to improve the N use efficiency in wheat with a view to minimum water use in drought prone areas. Three irrigation treatments; W_1 = Irrigation as Farmers practice; W_2 = Two irrigations (at CRI and before flowering /anthesis stage of wheat) and W_3 = Three irrigations (at CRI, flag leaf ligule emergence and before flowering /anthesis stage of wheat) were assigned in the main plots and four N treatments; N_0 = No nitrogen (control); N_1 = 50kg N/ha, N_2 = 100kg N/ha and N_3 = 150kg N/ha were assigned in the subplots. For isotopic study, ^{15}N labeled nitrogen fertilizer (10.48% a.e.) was applied in the isotopic micro-plot. The initial soil samples were collected from the experimental field for determining the physico-chemical properties of the existing soil. Field data on the different yield and yield contributing characters of wheat were recorded and analyzed statistically. Soil and plant samples were collected from both isotopic and non-isotopic plot for laboratory analysis. Considering the grain yield of wheat the highest yield was observed in the treatment combination W_3N_2 (4.97 t/ha), which was also showed similar results with the value from the treatment combination W_2N_2 (4.09 t/ha), W_3N_3 (4.36 t/ha) and W_1N_3 (4.02 t/ha). Similar results were noticed in case of straw yield of wheat and the maximum and minimum values were recorded in the treatment combination W_3N_2 (6.64 t/ha) and W_1N_0 (2.74 t/ha), respectively. Different irrigation and N levels affected on the amount of N uptake in grain and straw of wheat. The maximum N uptake of 75.54 kg/ha was noticed in the treatment combination of W_3N_2 , whereas, the minimum value (27.05 kg/ha) was found in W_3N_0 treatment. Regarding the N uptake in wheat straw, the highest (21.54 kg/ha) and lowest (5.75 kg/ha) values were noticed in the treatment combination of W_3N_3 and W_2N_0 , respectively. During the harvest of wheat, the soil samples were also analyzed for determining the content of total N, SOC and available P. From the study, it was observed that due to different irrigation and N levels the amount of total N, SOC and available P showed a variations, which ranged from 0.09 to 0.11% for N, 0.53 – 0.79% for SOC and 12.35 – 23.01ppm for available P in the soil during the time of wheat harvest.

Sher-e-Bangladesh Agricultural University

1. Influence of fertilizer, manure and water management on soil fertility, nutrient availability and productivity under Rice-Rice cropping system"

The depleted soil fertility is a major constraint to higher crop production in Bangladesh. Rice-rice cropping system is the most important cropping system in Bangladesh. The bioavailability, uptake and movement of nutrients in soil are dependent on soil moisture and the source of nutrient in soil. A boro rice experiment (8 fertilizer and manure treatments x 3 levels of irrigation x 3 replication = 72 plots) was conducted during 2011-2012 at SAU farm by using eight fertilizer treatments

and three irrigation levels. Another similar boro rice experiment (8 fertilizer and manure treatments x 2 levels of irrigation x 3 replication= 48 plots) was conducted at SAU farm where 48 PVC cylinders (40 cm length and 20 cm diameter) were installed in the middle of 48 plots before rice transplantation. Pore-water samples were collected from inner and outside (root zone area) of the cores by using rhizome sampler during the different dates of rice growing periods and analyzed for NPK and S concentrations. After harvest the yield and yield parameters were recorded and the NPK and S concentration in grain and straw are being analyzed. The yield and yield parameters of Boro rice were not significantly influenced by continuous flooding, saturated and alternate wetting and drying conditions. The different fertilizer treatments affected the yield parameters and yield of BRRIdhan 29. The higher yield and yield parameters were obtained where fertilizer was applied in combination with manure in two field experiments. The use of inorganic fertilizer plus compost performed better compared to inorganic plus poultry manure or coddung and 100% inorganic fertilizer. In both experiments, the highest grain yield of BRRIdhan 29 was found where 70% NPKS plus 3 ton compost/ha was applied. The pore-water NPK and S concentrations varied with irrigation, fertilizer treatment, cropping and stage of cropping. The higher concentrations of P were found in the pore-water of root zone area compared to non-cropped area (inside the ring) while the higher levels of pore-water K concentrations were found in the non-cropped area where root zone was absent. The higher pore-water P and K concentrations were found in the treatments where chemical fertilizer was used in combination with compost. The levels of P and K concentrations were higher in the treatment combination of fertilizer plus compost with continuous flooded condition. The higher levels of pore-water N were found in the treatments where chemical fertilizer was used in combination with manure.

Soil Resource Development Institute

1. Organic Amendments for Upland Crops under Light Textured Soils in Char (OAUC)

The experimental site was, according to BARC thematic area, selected in a *char land*. The site was located in Charharirampur union under Faridpur district in the physiographic of Active Ganges Floodplain (AEZ-10). The soil was light textured and calcareous in nature. Land preparation, pegging (demarking) of the main plot and sub-plots, weeding were done and protection measures taken accordingly. Cow-dung and poultry litter as organic amendment have applied to the field in the two successive crops with chemical fertilizers following IPNS. All inorganic fertilizers (P, K, S, Zn, B fertilizers) applied in full dose at final land preparation except N fertilizer. N-fertilizer applied in three splits. Crops selected were BARI Wheat-24 (Pradip) for Rabi season

(winter) and Parijat, a local variety of *B. aus* for Kharif season. Fertilizer treatments in wheat field were: T1 [N : P : K : S : B=182.19 : 24.71 : 24.71 : 17.78 : 3.36kg/ha + cow-dung=10ton/ha, Farmer's practice]; T2 [N : P : K : S : Zn : B=140.50 : 35.50 : 45.50 : 18.00 : 3.35 : 0.80, Fertilizers application as recommended by FRG]; T3 [N : P : K : S : Zn : B=136.0 : 34.0 : 40.5 : 18.0 : 3.35 : 0.8+Cow-dung=3ton/ha]; T4 [N : P : K : S : Zn : B=129.0 : 25.0 : 38.5 : 18.0 : 3.35 : 0.8kg/ha + poultry litter=1.5kg/ha]. Line sowing was followed for both crops. Irrigation was applied as necessary. The yield of wheat was found maximum in case of T₂ treated plots (6.11 t/ha) following T₄ treated plots (5.75 t/ha), then T₃ treatment (5.25 t/ha) and the minimum from farmer's own practice (T₁, 4.48 t/ha). Organic amendment with cow-dung (IPNS) and poultry litter (IPNS) increased wheat yield performance compared to farmer's practice. But it did not perform better than T₂. What positive effect organic amendment made to soil quality is yet to be identified. *B. aus* paddy was in active tillering stage. A leaflet (project overview) was prepared and multiplied for distribution to farmers and other stakeholders. Fifty farmers were trained on soil sample collection techniques, balanced fertilizer application and the role of organic matter into the soils.

2. Effect of Different Hedge Species on Soil Erosion and Crop Yield at Different Hill Slopes of Chittagong Hill Tracts

Chittagong Hill Tracts (CHT) is the largest hilly area located in the southeast part of Bangladesh. The region covers an area of about 13,181sqkm. Major agricultural activities in these areas are traditional rainfed farming which is locally known as "Jhum" and commonly known as "Shifting cultivation" or "Slash and burn" system. Jhum cultivation in hilly areas causes gully erosion and loss of soil ranges from 10 to 120 t ha⁻¹yr⁻¹. Alley cropping or hedgerow cultivation is very helpful in controlling soil erosion in the hilly area. So far very little scientific effort have been taken to test the effect of different hedge species in controlling soil erosion in different slopes of CHT, which could reduce pressure on already squeezed suitable Jhum land. If the farmer can harvest more crops from reasonably smaller plot then decrease existing Jhum coverage, reduce deforestation and improve soil health by reducing soil erosion and runoff. This program was, therefore, designed to select suitable hedge species and their alley width in respect to slope which will minimize soil loss and increase crop yield. In order to perform cataloguing the hedges and their alley were use selected such as Indigofera, Bogamedula, Pineapple and Napier. Three different slopes are gentle slope, moderate slope and steep slope. Plot size is 10x5m. Four different crops are Yard long bean, lady's finger, Bitter gourd and Maize. The experiment was laid out in split plot design with three replications. Soil erosion will be measured through spike lay out method. Fertilizers applied based on soil test value.

Collected data will be statistically analyzed following MSTAT program. During the establishment of four different hedge species tomato was cultivated in Rabi season. It was found that all the yield and yield attributing characters were influenced by different hedge species and slope gradient. The highest number of clusters/plant, fruits/plant, branches/plant, fruits/cluster, fruits weight, fruit length, fruit diameter and yield was recorded in pineapple hedge in different slopes. The maximum net returns over variable cost were obtained from pineapple hedge in different slopes. The highest BCR was obtained from pineapple applied plot followed by Bogamedula, Napier and Indigofera hedge treatment, whereas, the lowest BCR was recorded in control plot. The target crops such as yard long bean and okra seeds were dibbled in kharif-1. The result of ongoing crops will be narrated after the completion of the season.

Bangladesh Agricultural University

1. Production of Somaclone In vitro for Drought Stress Tolerant Plantlet Selection in Potato

An experiment was carried out in plant tissue culture laboratory of the Department of Crop Botany, Bangladesh Agricultural University, Mymensingh to assess the callus induction ability, plantlet regeneration from callus and production of drought stress tolerant somaclones in potato. Potato cv. Diamant and Asterix tubers were germinated on sand and shoot buds were explanted on MS medium with different PGRs to regenerate plantlets. Subsequently leaf, node and internodes of in vitro grown plantlets were used as explants. The cultures were maintained in a growth room at $25 \pm 2^\circ\text{C}$ under light intensity of $35 \mu\text{mm}^{-2}\text{s}^{-1}$ illuminated with florescent tubes. As explant, internode was the best for callus induction as the highest 100 percent explants induced callus. The lowest percent was for leaf explants. Among the plant growth regulators combination of 2, 4-D and NAA at 2.0 mgL^{-1} each was the best for callus induction and also for higher growth of induced callus. Combined effect of 2,4-D and NAA were always better than single effect of any one. BA affected plantlet regeneration from callus and cent percent explants regenerated plantlet at 5.0 mgL^{-1} of BA. The highest number of shoot (3.0), length of shoot (8.0 cm), number of roots (20) and length of root (3.0 cm) were found at 5.0 mgL^{-1} BA supplemented medium over other treatments. Among the treatments of Kn and IAA, the highest percent (100) explants regenerated plantlets at 2.0 mgL^{-1} each and the lowest 50% was observed at 3.0 mgL^{-1} each. The highest number of shoots per explant, length of shoot, number and length of root were obtained with Kn + IAA at 2.0 mgL^{-1} each supplemented BM. Thus, internode explant on MS medium supplemented with 2,4-D and NAA at 2.0 mgL^{-1} each was the best for callus induction and BA 5.0 mgL^{-1} or Kn + IAA at 2.0 mgL^{-1} each supplemented BM

was suitable for callus derived plantlet production in potato. Callus derived plantlets were cultured in PEG supplemented MS medium to produce drought stress tolerant somaclones in the above two cultivars of potato and experiments are going on.

2. Development of short duration high yielding rice varieties

The main goal of this research is to develop short duration, stable and high yielding rice varieties for Aus, Aman and Boro seasons to fit into the existing cropping patterns. Breeding line SL – 9 and ADT(R)47 selected as donor (male) parent and BRRIdhan 52, BRRIdhan 53, BRRIdhan 57 as recipient (female) parent for Aman season and Crosses were made among the selected parents. For Boro season, crosses were made in BRRIdhan 28 X IR 77734-93-2-3-2, BRRIdhan 29 X ADT(R) 47 and BRRIdhan 55 X IR 77734-93-2-3-2. Crosses will be done in BRRIdhan 48 X Parija, BRRIdhan 55 X Parija, BRRIdhan 48 X NERICA 2, BRRIdhan 55 X NERICA 2, BRRIdhan 48 X NERICA 4, BRRIdhan 55 X NERICA 4 to obtain short duration high yielding Aus rice. The most promising ones will be selected from the hybridized generations following the modified pedigree method.

3. An Integrated Approach for the Management of Wilts and Foot Rot/Collar Rot of Important Vegetables

Management of wilts and collar rots in some important vegetables through bio-control approaches was studied. For this purpose, *Trichoderma harzianum* CP (an IPM Lab strain) was formulated in grain brans @ 22 different combinations. Lab bio-assay of *T. harzianum* CP against wilts and collar rot pathogens proved the antagonist completely inhibited the growth of *Fusarium oxysporum* pv *melongenae*, *Ralstonia solanacearum* and *Sclerotium rolfsii*. *Trichoderma* produced the maximum of CFU 6.100×10^8 per gram of black gram-peat soil mixture. The second highest CFU $6.090 \times 10^8/\text{g}$ was produced in grass-pea peat soil mixture, third highest CFU 5.800×10^8 was in chickpea-peat soil combination. In the net-house tray soil experiment, inoculated soil treated with formulated trichoderma @ 20g/Kg of soil ensured 82-87% seed germination in tomato, eggplant and Indian Spinach. The treatment reduced pre-emergence death to 13-20% and damping-off to 0.7 – 1.0%. The foot rot was completely checked by the treatment as against 10-13% in the inoculated tray. Soil treatment with formulated trichoderma @ 15g/Kg soil yielded better effect than the treatment@ 10g/Kg . Field trials with the formulated trichoderma are in progress.

4. Organic amendments for mitigating soil salinity in rice-maize cropping system

Salinity causes cellular damage to plants. Accumulation of organic compound is one of the adaptive mechanisms to salt stress in plants. The main objective of this project was to mitigate the adverse effects of salt stress in rice

and maize crops through organic amendments. The pot experiments were conducted at the Department of Soil Science, BAU with two rice (salt-sensitive; BRRI dhan29 & salt-tolerant; BINA dhan8) and two hybrid maize varieties (BARI Maize 5 and Pacific 987). Plants were exposed to salinity at vegetative stage. Proline was applied as a foliar spray at a volume of 25 ml per plant. Farmyard manure (FYM) and poultry manure (PM) were added to the soils before planting. Salt stress caused a significant decrease in growth and yield of both salt-sensitive and salt-tolerant rice. Salt stress also significantly decreased the growth and yield of both maize varieties. High salt stress drastically decreased growth of rice and maize. Foliar application of proline significantly improved growth and yield of both rice varieties and of BARI Hybrid Maize 5 in response to salt stress. BINA dhan8 and BARI Hybrid Maize 5 conferred tolerance to high salt stress when proline was applied exogenously. Salt stress decreased chlorophyll contents and K^+/Na^+ ratio in both rice varieties and activities of antioxidant enzymes in BRRI dhan29 but increased proline accumulation in BRRI dhan29. Overall, application of proline increased chlorophyll and ascorbate contents, proline accumulation, K^+/Na^+ ratio, and activities of antioxidant enzymes in rice under salt stress. Application of proline also increased chlorophyll contents, K^+/Na^+ ratio and P uptake by maize under salt stress. Organic amendments with both FYM and PM increased chlorophyll content and K^+/Na^+ ratio, thereby mitigating the inhibitory effects of salt stress in both rice varieties. Similarly, both FYM and PM improved K^+/Na^+ ratio and mitigated the inhibitory effects of salt stress in both maize varieties. Hybrid Maize Pacific 987 grown in low salt stress with FYM or PM amendments produced higher yield than control condition. On the contrary, BARI Hybrid Maize 5 conferred tolerance to high salinity, when soils were amended with FYM or PM. Addition of manures improved electrical conductivity (EC), exchangeable Na and organic matter status of soils at saline condition. The present study suggests that organic amendments with proline or manure improve salt tolerance of rice and maize by increasing chlorophyll content, K^+/Na^+ ratio, nutrient uptake, proline accumulation and enhancing antioxidant defense system.

5. Production of genetically male tilapia by identification of YY supermales using microsatellite DNA markers

Monosex (male) Nile tilapia *Oreochromis niloticus* is highly preferable for commercial production system to control unwanted reproduction by females and to obtain higher growth of even sized male tilapia leading to good profit. The technique of producing all male using androgen hormone (particularly 17- α -methyl-testosterone) is being widely used in Bangladesh. However, the use of hormone in the direct food chain is prohibited in many countries of the world because of the adverse physiological effects. Very recently, sex-linked markers

have been identified for Nile tilapia which can assist selection of YY males in tilapia. The current study aims at the production of genetically male Nile tilapia using such markers. The production of YY males in conventional way and identification of those supermales by the sex-linked markers is the target of the present study. Hormonal sex reversal of mixed sex has been performed to obtain XY neofemales. The aceto-carmin gonad squashing method will detect the percentage of sex-reversal rate to continue breeding between XY neofemales and XY normal males to get 25% YY progeny.

6. Study of reproductive endocrinology of mud eel *Monopterus albus* for artificial propagation

In order to understand different aspects of reproductive biology of endangered mud eel *Monopterus albus* gonado-somatic index (GSI), gonadal maturity stages, fecundity, ova diameter and secondary sexual characters were studied for a period for one year. Fish samples were collected from *haor* and *beel* areas of Mymensingh and Netrokona districts. The highest GSI of $6.002 \pm 1.672\%$ was observed in mid May and lowest of $0.232 \pm 0.015\%$ in September. This indicated that the peak breeding season of mud eel was from late April to early May. Monthly observation of ovarian gametogenesis utilizing routine haematoxyline-eosin protocol identified presence of undeveloped oocyte (UO), oogonium (O), early perinucleolar oocyte (EPNO), late perinucleolar oocyte (LPNO), previtellogenic oocyte (PVO), yolk vesicle (YV), yolk granule (YG), premature (PM) and mature (M) stages of oocytes in ovary samples from different seasons. In this study, the mature stages of oocytes (PM and M oocytes) were found from April to June samples of ovary, indicating the spawning season of *M. albus*. The ovaries contained developing oocytes (UO, EPNO, and LPNO) from July to February, indicating spent and resting phases of ovary during these months. Fecundity was measured for a period from mid March to mid May and ranged between 132 (body weight 240g) to 461 (body weight 380g). The highest fecundity was observed in mid April and the lowest was in mid May. Ova diameter was estimated during the breeding season which ranged between 3.1 to 3.9 mm. Ova diameter was highest in mid May and lowest in mid April. The most distinct feature to separate the both sexes was shape of their genital papilla. The female papilla became rounded and swollen; on the other hand the male genital papilla was sunken and elongated, observed in April-May. This study provides the first detailed information about oogenesis of *M. albus* from the Sylhet basin of Bangladesh. It is expected that the information of this study can potentially be used for bringing a new high priced fish into aquaculture for supporting export earnings of the country in future.

7. Remote controlled *Guti* Urea Applicator

The application of *guti* urea requires 25-35% less urea and one round application per crop than that of traditional

hand broadcasting method. On the other hand, yield of rice increases by 15-20 %. However, placement of *guti* urea below the soil surface is a laborious, back breaking work for farmers. Furthermore, farmers have to walk hard across the muddy field many times which make them unwilling to work. With a view to solve the above difficulties and to provide more comfort to farmers, this research project has been initiated to develop a remote controlled *guti* urea applicator that could place *guti* urea efficiently. The necessary component of the device such as metering unit, the chassis, furrow opener and furrow closer have been designed and fabricated. The battery of required matching power and remote control mechanism have been selected. The first version of the device is now ready for assembling. The work progress is satisfactory and is on planned schedule.

Sylhet Agricultural University

1. Development of artificial breeding techniques of *Sperata aor*

Bangladesh is blessed with a rich fish biodiversity and is ranked third in inland fisheries in Asia after China and India with approximately 300 fresh and brackish water fish species (Hussain and Mazid, 2001). Fish and fisheries play important roles in the economy of Bangladesh. Once upon a time, the country was enriched in various indigenous fish species. But now these species are declining day by day due to various anthropogenic reasons. Ayre (*Sperata aor*) commonly named as long-whiskered catfish is one of the important bagrid catfish. It has been considered as one of the most admired edible fish among indigenous catfish species due to good taste and high nutritive value. This fish species has a very good market demand. But unfortunately natural stocks of this species have drastically reduced and become threatened due to overfishing, habitat degradation, aquatic pollution, and several other anthropological reasons. Presently, *S. aor* is regarded as vulnerable (IUCN-Bangladesh 2000) fish species. In order to maintain this fish population as well as to conserve their biodiversity in nature immediate measures should be taken. So, the overall goal of this project was to carry out a detailed and in-depth scientific study in order to establish artificial breeding techniques of *S. aor*. To achieve this goal it is necessary to understand the breeding biology of this species, assess their reproductive potential in captive condition as prerequisites. A number of brood fish were collected and reared in the research ponds both on station (Research ponds in the Sylhet Agricultural University campus) and on farm (American fish farm Ltd. at Zakigonj) for nine months periods. Their growth performances were measured on month basis. To examine the monthly changes in the gonads for estimating spawning season, the GSI was calculated by: $GSI = (\text{Weight of gonads} / \text{weight of fish}) \times 100$. The average length and weight of the *S. aor* fry became 27 cm and 148 gm, respectively on station in April. While

on the farm it became 39 cm and 700 g, respectively. On the other hand, average length and weight of the brood became 34 cm and 500 g, respectively on station. While on the farm it was 45 cm and 1000 gm, respectively. The brood fishes reared in on station ponds did not perform natural breeding yet. But on the other hand, natural breeding of *S. aor* was observed in on farm in captivity. The GSI of female was found to be decreasing from October to February and lowest was recorded on December. It was found to be increasing from February to May. On the other hand, the lowest GSI value of male was found in November and after that it was gradually increasing and the highest value was observed in May.

2. Adaptation of heat tolerant tomato and photo insensitive country bean variety during summer season in Sylhet region

This project was undertaken with a view to adapt of heat tolerant tomato hybrids and photo insensitive country bean variety and their production technologies during summer season in Sylhet region. Four heat tolerant tomato hybrids and four photo insensitive country bean lines were included in this study of which 150g hybrid seed of BARI Hybrid tomato-4 and 850 g seeds of one photo-insensitive country bean line were produced during winter season of 2011-12 for further evaluation and demonstration in the farmer's field. Seeds of other varieties were collected from BARI for evaluation under Sylhet condition. One trainers training comprising DAE, BADC and NGO personnel and two farmers training comprising 20 farmers each were organized on summer tomato and summer bean production technology during the month of April and May 2012. Summer tomato and summer country bean seeds and other logistic support were given to 30 farmers of Sylhet and Moulavibazar districts for field demonstration. On station evaluation of 4 photo-insensitive country bean lines and 4 heat tolerant tomato hybrids were started from the month of April and May 2012, respectively in the experimental field of Sylhet Agricultural University. These evaluations are going on. Fruit bearing status of tomato and country bean lines are very encouraging both in on station and on farm demonstration. Harvesting of ripe fruit of tomato and green pod of country bean is going on in regular interval and necessary information regarding yield and yield attributes are collecting properly for interpretation of the results.

C. Monitoring of Programmes/Activities

Eight teams were formed with the scientists of BARC for field monitoring of the Research/Technology Transfer Programmes carried out during the period of 2011-12. The teams were assigned to visit and monitor the BARC funded Research/Technology Transfer Programmes implemented by different NARS and associate institutes. The following table presents the team compositions, monitoring regions, organizations visited:

Table 1. Team composition for Field Monitoring of Core Research activities under Research Grant Fund of BARC (2011-12)

Team No.	Location	Institutes Involved	Project-No.	Team Composition
1	Gazipur,	BARI(Gaz.)	1, 2, 7, 8	Ms. Dil Afroz, Director(AIC)- Team Leader Dr. P.C. Golder, CSO(P&E) –Member Dr. Mian Sayeed Hassan, PSO (Crops)-Member
2	Gazipur, Dhaka	BARI(Gaz.), BRRI(Gaz.), SAU(Dha.)	9, 10, 11, 12, 29, 30	Dr. Md. Ahmad Ali Hassan, MD(NRM)- Team Leader Dr. Abul Kalam Azad, CSO(Crops)-Member Mr. Md. Aminuzzaman, Director(Training) –Member Dr. S.M. Bokhtear, PSO (Soil)-Member Dr. Fauzia Yasmin PSO(AERS), BARC
3	Mulovibazar	BARI(Mul.), Syl –AU(Syl)	2, 33, 34	Dr. Meraz Uddin Ahmed, MD (A&F) - Team Leader Dr. Mohammed Shahjahan, CSO (Forest)- Member Dr. Shah Md. Ziqrul Haque Chowdhury CSO (Livestock)-Member Mr. Md. Mustafizur Rahman, PO- Member
4	Jamalpur, Sherpur, Mymensingh	BARI(Jam. She.), BINA(Mym), BAU(Mym)	3, 15, 17, 18, 19, 20, 21	Dr. M.K. A Chowdhury, MD (Crops)-Team Leader Dr. A.S.M Anwar, CSO (AERS)- Member Dr. M. A Salam, PSO (P&E)-Member
5	Mymensingh	BAU(Mym)	22, 23, 24, 25, 26, 27, 28	Dr. S. M. Khalilur Rahman, MD (AERS)-Team Leader Dr. S. M Khorshed Alam, PSO (Crops)-Member Dr. Monirul Islam, PSO(Nutrition) -Member
6	Jessore, Satkhira, Faridpur, Rajbari	BARI(Jes.), BINA(Sat.), SRC(Far.,Raj.) SRDI(Far.)	4, 6,15, 20,31	Mr. Md. Abeed Hossain Chowdhury Director (Computer)-Team Leader Dr. M. A. Satter, CSO (Soil)-Member Mr. Md. Monowar Hossain, PSO (TTMU)-Member Mr. Ajit Kumar Chakrabarty, DD(Accounts) Ms. Susmita Das, Senior Documentation Officer
7	Bogra, Rajshahi, Natore	BARI(Bog.), BINA(Bog.), BARI(Raj.), BINA(Nat., Raj.)	4, 7, 14, 15, 16, 29	Dr. Kabir Ikramul Haque, MD (Fisheries)- Team Leader Dr. M. A Awal, PSO (P&E)-Member Dr. Md. Baktear Hossain, PSO (Soil)-Member Md. Abdul Mottakin, Senior AD(Audit)
8	Barisal, Patuakhali, Bhola	BARI(Bar.), BJRI(Pat.), BINA(Bar, Bho.)	5, 13, 14, 15	Dr. Sultan Ahmed, CSO (Agril.Eng.)-Team Leader Dr. Md. Aziz Zilani Chowdhury, CSO (Crops)-Member Md. Mahbubul Hassan, Senior AD(Admin.)

Field Monitoring of Projects (2011-2012) under “Research Grant” of BARC

Monitoring Report of Team-1

The team 1 consists of Ms. Dil Afroz, Director (AIC), Dr. Paresh Chandra Golder, CSO (P&E) and Dr. Mian Sayeed Hassan, PSO (Crops) visited Bangladesh Agricultural Research Institutes (BARI), Gazipur on 22 February 2012. A total of three research projects were monitored by the team.

(a)Improvement of gladiolus quality and its adaptation:

The team discussed with the Director, Horticulture Research Centre, BARI and the concerned principal Investigator Dr. Kabita Anzu-Man-Ara, PSO, Floriculture Division, BARI on the progress of activities.

Director, HRC opined that the “Research Grant” fund of BARC is very helpful in supporting the research activities

of BARI. He instructed the investigators to implement the project with full efforts. Then the team visited the field trials. There were three different experiments as on-station trial and one as on-farm trial. The team visited only the on-station trials and opined that all the three experiments were well managed and progress were satisfactory. The team suggested to include the locally adapted cultivar of gladiolus in the varietal performance trial.



The team comprised of Ms. Dil Afroz, Director (AIC), Dr. Paresh Chandra Golder, CSO (P&E) and Dr. Mian Sayeed Hassan, PSO (Crops) visited the varietal trial of gladiolus.

BARI was also present during discussion. The team observed that the project activities were not performed

(b) Development of technology for production of seedless fruits of guava and lemon (Mini Elachi lebu) in off season through application of GA₃ on floral bud:

This project is being implemented by Dr. Md. Nazirul Islam, PSO, HRC, BARI. The Director, Horticulture Research Centre, BARI was also present during discussion. The team observed that the project activities were not performed

perfectly. However, the team suggested to study the off-season flower and fruit production of guava and lemon by GA₃ application. The team also advised to redesign the project activities to achieve the expected output.



The team comprised of Ms. Dil Afroz, Director (AIC), Dr. Paresh Chandra Golder, CSO (P&E) and Dr. Mian Sayeed Hassan, PSO (Crops) visited the guava plantation with GA₃ application.

(c) Development of packages for (Mango and banana) and vegetables (Yardlong bean, pointed gourd, okra):

The project is being implemented by Mr. Mohammad Mizanur Rahman, SO, Post-harvest Technology Division, BARI. Dr. Mian Uddin Ahmed, PSO and head of the Division was present during the visit. Dr. Mohammad Mizanur Rahman informed the team that necessary polythene packets, plastic crates, wooden box, corrugated fire box (CFB) and laboratory consumables have been collected. After visiting the different activities, the team opined that the overall progress of the project was not satisfactory. The principal investigator of the project only demonstrated the wooden and plastic crates as packaging materials. The team suggested to work the use of polyethene packets of different densities and ensure the quality issues of the crops under study.



The team comprised of Ms. Dil Afroz, Director (AIC), Dr. Paresh Chandra Golder, CSO (P&E) and Dr. Mian Sayeed Hassan, PSO (Crops) visited the packaging trial of Postharvest Technology Division.

Monitoring Report of Team- 02

A five member monitoring team was formed to observe the progress of the Core Sub-Projects conducted by

different research institutes and university like BARI, BRRI and SAU. The team leader and members were Dr. Ahmad Ali Hassan, MD (NRM), Dr. Md. Abul Kalam Azad, CSO (crops), Md. Aminuzzaman, Director (M&T), Dr. Shiekh Md. Bakhtear, PSO (Soil)) and Dr. Fauzia Yasmin, PSO (AERS) of BARC. The team monitored the progress of activities of the following projects on 27-28 February, 2012.

1. Study on the Rural Household's Food Security in Coastal Region of Bangladesh at Bangladesh Agricultural Research Institute, Gazipur.
2. Impact of Agricultural Cash Subsidy System on the Rural Farm Economy of Bangladesh, Bangladesh Agricultural Research Institute, Gazipur.
3. Economic Impact of Climate Change in Southern Zone of Bangladesh, Bangladesh Agricultural Research Institute, Gazipur.
4. Hybrid Rice Technology and its Sustainability at the Farm Level: A Study on Food security for Farm Household, Bangladesh Rice Research Institute, Gazipur.
5. Influence of Fertilizer, Manure and Water Management on Soil Fertility, Nutrient Availability and productivity Under Rice-Rice Cropping System, Sher-e- Bangla Agricultural University, Dhaka.
6. Evaluation of New Plant Type (NPT) Advanced Lines of Rice for Aman Seasons as High Yielding Varieties, Sher-e-Bangla Agricultural University, Dhaka.

Monitoring Report of Team- 04

The team members were Dr. Md. Khalequzzaman A. Chowdhury, MD (Crops), BARC-Team Leader, Dr. A.S.M. Anwarul Huq, CSO (AERS), BARC, Team member, and Dr. Md. Abdus Salam, PSO(P&E), BARC, Team member. The monitoring team monitored the implementation progress of five core research projects at BINA and BAU, Mymensingh during 02-04 May 2012. The following projects were monitored by the team.

(1) Development of short duration high yielding boro rice varieties through induced mutation.

Objective (s):

- (i) To develop boro rice variety(s) with yield potential of 8.0-8.5 t/ha and 155-160 days maturity
- (ii) To develop short duration (115-120 days) boro rice variety(s) with 6.0-6.5 t/ha yield

Implementing Agency & Division/Section: Plant Breeding Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh.

Name & Designation of the Programme Leader with address: Dr. Md. Abul Kalam Azad, Principal Scientific Officer, Plant Breeding Division, Bangladesh Institute of Nuclear Agriculture (BINA), BAU Campus, Mymensingh-2202

Implementation Locations: 9 (BINA Farm, Mymensingh; BINA sub-station farms at Magura, Rangpur, Barisal and Farmer's field at Mymensingh, Satkhira, Natore, Rajshahi and Rangpur)

Major Activities:

SL.	Planned Activities	Implementation Status
A.	Zonal Yield Trial with 2 Early Maturing Boro Mutant Lines	
i.	Selection and preparation of land and raising seedlings of short duration boro rice	These activities have been completed during 1 st December 2011 to mid February 2012 as per schedule
ii.	Transplanting of seedlings and intercultural operations	Transplanting has been performed during 3 rd week of February to 1 st week of March 2012 as per schedule over 9 locations.
iii	Harvesting	These experiments are expected to be harvested during 2 nd and 3 rd week of May 2012
iv	Training/field days	4 field days will be arranged at Mymensingh, Magura, Barisal and Rangpur during harvesting time
B.	Preliminary yield trial with M ₆ high yielding mutant lines of boro rice	
i.	Selection and preparation of land and raising seedlings of short duration boro rice	These activities have been completed during November 2011 as per schedule
ii.	Transplanting of seedlings and intercultural operations	Transplanting has been performed January 2012 at BINA HQ farm, Mymensingh as per schedule
iii	Harvesting	This experiment is expected to be harvested during 3 rd and 4 th week of May 2012

Budgetary Information:

- i) Total Approved Budget Tk: 4.0 lakh ii) Fund released (to date) Tk: 3.0 lakh
iii) Fund spent (to date) Tk: 2.88425 lakh

Constraints & Suggestions:

Constraints	Suggestions
(i) The PI has no power to recruit even a casual labour	BARC authority can suggest DG, BINA to give authority to PI to recruit casual labourer and other project personnel through forming a committee headed by PI.
(ii) The PI has no drawing and disbursing power	BARC authority can suggest DG, BINA to give authority to PI to draw project money with joint signature of DD finance, BINA and PI.
(iii) There is no incentive for the responsible scientists and scientific assistant	(i) The scientist and scientific assistants responsible for executing the project should have some incentive in the form of honorarium, at least 1 month basic salary per year. (ii) The scientist should be awarded at least with a certificate and some cash money for development of any variety or technology through this project.

Observation of the Monitoring Team:

The monitoring team visited the on station and farmers' field Zonal Yield Trial (ZYT) and PYT on station. Both crop conditions were good and experimental management was satisfactory. At ZYT, mutant RM(1)-200(C)-1-10 performed better. On the other hand, at PYT, mutant RM (2)-200(C)-1-10 performed better.



Team visited the field and consulted with the PI

2. Organic amendments for mitigating soil salinity in rice-maize cropping system

Objective (s):

- To investigate the effect of proline and manure on K^+/Na^+ ratio, chlorophyll content, yield and nutrient uptake by rice and maize under salt stress condition.
- To examine the effect of proline on antioxidant defense systems in rice and maize under salt stress condition.
- To examine the effect of different manures on changes in soil pH, EC, ESP and organic matter status.

Implementing Agency & Division/Section: Department of Soil Science, Bangladesh Agricultural University, Mymensingh.

Name & Designation of the Programme Leader with address: Dr. Md. Anamul Hoque, Associate Professor, Department of Soil Science, Bangladesh Agricultural University, Mymensingh-2202

Implementation Locations: Department of Soil Science, Bangladesh Agricultural University, Mymensingh

Major Activities:

Sl.	Planned Activities	Implementation Status
1.	Soil samples collection	Soil samples were collected from BAU Farm for pot experiments
2.	Analysis of initial soil samples	Initial soil analysis done
3.	Collection of maize seeds	Maize seeds were collected from BARI, Joydebpur and Mymensingh town
4.	Pot experiment with maize	Pot experiments with maize (BARI hybrid maize 5 and Pacific 987) were conducted at the net house of Soil Science Dept., BAU. The crops were harvested at maturity stage.

Sl.	Planned Activities	Implementation Status
5.	Pot experiment with boro rice	Rice seedlings (BINA dhan8 and BRRI dhan29) were transplanted in pot at the net house of Soil Science Dept., BAU. Plants were exposed to salinity at active tillering stage, and proline and organic manures were applied as per treatments.
6.	Recording of yield contributing characters, and grain and straw yields	Plant parameters and yield of maize were recorded.
7.	Chemical analysis of plant and soil samples	Chlorophyll contents in rice and maize plants were measured. Now other chemical analyses are being performed.
8.	Procurement of equipments, chemicals & glassware	Procured of some chemicals and laboratory items.

7. Budgetary Information:

- Total Approved Budget Tk: 4,00,000/-
- Fund released (to date) Tk: 3,00,000/-
- Fund spent (to date) Tk: 2,15,367/-

Constraints & Suggestions:

Constraints	Suggestions
1. Delay in procurement process	Approval of the procurement plan by BAURES should be rapid

Observation of the Monitoring Team:

BINA dhan-8 and BRRI dhan-29 seedlings were transplanted in pot at the net house of Soil Science Dept., BAU. Plants were exposed to different salinity at



Team observed the experimental activities

active tillering stage, and proline & organic manures were applied as per treatments. Among the treatments poultry manure (4t/ha) performed better.

3. Biological Nitrification Inhibition is a novel approach for enhancing nitrogen use efficiency in cereal

Objective (s):

- To collect and evaluate the sorghum germplasm from different regions for BNI function

- To check the stability and ability of BNI from sorghum in the soil
- To evaluate of the nitrification inhibitory compounds from sorghum on rice growth environment
- Physiological studies on the mechanisms effecting BNI-compounds release; mode of action of BNI release from roots

Implementing Agency & Division/Section:

Department of Crop Botany, Bangladesh Agricultural University, Mymensingh.

Name & Designation of the Programme Leader with

address: Dr. A.K.M. Zakir Hossain, Professor, Dept. of Crop Botany, Bangladesh Agricultural University, Mymensingh-2202

Implementation Locations: Plant Physiology Laboratory, Crop Botany Field Laboratory, Professor Muhammed Hossain, Central Laboratory, BINA Laboratory

Major Activities:

Sl. No.	Planned Activities	Implementation Status
1.	Collect and evaluate the sorghum germplasm from different regions for BNI function	Among the tested sorghum varieties, none of the varieties showed detectable BNI capacity except hybrid sorghum from Japan.
2.	Stability and ability of BNI from sorghum in the soil	PI conduct this experiment as per planned
3.	To evaluate of the nitrification inhibitory compound/s from sorghum on rice growth environment	If rice-sorghum-rice cropping pattern is followed, rice plant can grow with lesser amount of nitrogen supply compare to recommended dose in the soil

Budgetary Information:

- Total Approved Budget Tk:4,00,000
- Fund released (to date) Tk:2,00,000
- Fund spent (to date) Tk:2,00,000

Observation of the Monitoring Team:

PI established a modern hydroponic Laboratory.



Team observed the field activities

Monitoring team visited the field where germplasm trial conducted. The crop condition and management were good.

4. Development of short duration high yielding rice varieties

Objective (s):

- To select and develop short duration high yielding rice varieties for the Boro, Aus and T. aman seasons to fit into the existing cropping pattern

Implementing Agency & Division/Section: Department of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh-2202.

Name & Designation of the Programme Leader with address: Professor Dr. Lutful Hassan, Department of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh-2202.

Implementation Locations: Three upazillas of Mymensingh district viz., Sadar, Muktagacha and Haluaghat are considered for the experiment.

Major Activities:

Sl. No.	Planned Activities	Implementation Progress up to 25 th March 2012
1.	Selection of short duration local varieties for Aus, Aman and Boro seasons	PI conduct this experiment as per plan
2.	Selection of short duration modern varieties for Aus, Aman and Boro seasons	PI conduct this experiment as per plan
3.	Selection of advanced lines for short duration high yielding rice developed by the department of Genetics & Plant Breeding, BAU	PI conduct this experiment as per plan
4.	Hybridization program involving popular high yielding varieties of rice with longer duration and the short duration low yielding rice varieties and selection and confirmation of the F ₁ populations	Aman 2011 completed; Boro 2012 & Aus 2012 is in progress
5.	Growing of F ₁ population and collection of F ₂ seeds	Will be started in June

Budgetary Information:

- Total Approved Budget Tk. 3,13,660/-
- Fund released (to date) Tk: 2,35,245/-
- Fund spent (to date) Tk: 2,34,813/-

Observation of the Monitoring Team:

The monitoring team visited the field laboratory of Department of Genetics and Plant Breeding, Bangladesh



Team observed the laboratory activities

Agricultural University. They observed the Hybridization program involving popular high yielding varieties of rice with longer duration and the short duration low yielding rice varieties and selection and confirmation of the F₁ populations. Seedlings were raised in the pot for Aus Season.

5. Production of Somaclone *In vitro* for Drought Stress Tolerant Plantlet Selection in Potato

Objective (s):

- To establish a protocol on callus induction, proliferation and for high frequency plantlet regeneration through somatic embryogenesis.
- To development a system for selection of somaclones *in vitro* under salinity and drought stress.
- Isolation and development of salinity and drought tolerant strain for farmer use.
- Capacity building and manpower development on *in vitro* somaclone production in potato.
- Creation of knowledge on morpho physiological features and production potential of *in vitro* grown potato.

Implementing Agency & Division/Section: Department of Crop Botany, Bangladesh Agricultural University, Mymensingh-2202

Name & Designation of the Programme Leader with address: Dr. M. Obaidul Islam, Professor, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh-2202

Implementation Locations: Department of Crop Botany, Bangladesh Agricultural University, Mymensingh-2202

Major Activities:

Sl. No.	Planned Activities	Implementation Status
1	Establishment of meristem culture	
	i) Seed potato collection	Seed potato of var. Diamant, Falcina and Astarix were collected from BRAC centre, Gazipur, BARI, Gazipur and BADC, Jamalpur
	ii) Seed potato collection establishment in sand for shoot bud initiation.	
	iii) Standardization of sterilization time and sterilizer's concentration for plant sample sterilization.	Time 5min, Concentration 1%Hgcl Standardized
	iv) Meristem isolation technique development.	Completed
	v) Meristem culture in test tube.	Completed
	vi) Selection of suitable plant growth regulator for meristem culture.	2,4-D and NAA selected
	vii) Standardization of plant growth regulator conc. for meristem culture.	As per plan conducted this experiment

Sl. No.	Planned Activities	Implementation Status
	viii) Suitable medium selection for meristem	As per plan conducted this experiment
	ix) Meristem derived plantlet regeneration	As per plan conducted this experiment
2	Callus derived somaclones production protocol establishment	
	i) Node and internode segment of meristem derived plantlet culture for callus induction.	As per plan conducted this experiment
	ii) Suitable medium selection for callus induction.	As per plan conducted this experiment
	iii) Standardization of plant growth regulators conc. for callus induction.	As per plan conducted this experiment
	iv) Multiplication of induced callus in different organic extracts supplemented medium	As per plan conducted this experiment
	v) Callus derived potato plantlet regeneration.	As per plan conducted this experiment

Budgetary Information:

- Total Approved Budget Tk: 3,12,000/-
- Fund released (to date) Tk: 2,34,000/-
- Fund spent (to date) Tk: 2,23,490/-

Observation of the monitoring team:

Team visited the Laboratory and found more than 3500 plantlets in laboratory. PI told that he obtained salt and drought stress somaclone. In the next coming season he will conduct the field trial.

Implementation progress of research activities (Lab./Green house/Field)

Sl. No	Planned major activities	Actual attainments
1.	Collection of seeds/propagules of major mangrove species from the Sundarban	20,000 healthy seeds / propagules of khilshi, kirpa, sundari, passur, goran and kankra were collected from the Sundarban.
2.	Nursery raising and maintenance	Nursery were raised with the collected seeds/propagules of six mangrove species at Bogi Forest Research Station, Saronkhola, Bagerhat; Dhangmari Forest Research Station, Dakop, Khulna and Munshiganj Forest Research Station, Shamnagor, Satkhira in the Sundarban.
3.	Site selection and site preparation for plantation	Three experimental sites were selected for mangrove species trials in three salinity zones of the Sundarban. These were barren and covered with grasses or non-commercial species like <i>Derris trifoliata</i> , <i>Dalbergia spinosa</i> , <i>Acanthus ilicifolius</i> , <i>Acrostichum aureum</i> , <i>Hibiscus tiliaceous</i> , dhanshi (<i>Myriostachya wightiana</i>) and kewa katta (<i>Pandanus foetidus</i>). The experimental sites were prepared by jungle cutting and clearing. Through weeding was done before raising plantation.
4.	Plantation raising and maintenance	The seedlings of Sundri (<i>Heritiera fomes</i>), Pasur (<i>Xylocarpus mekongensis</i>), Baen (<i>Avicennia officinalis</i>), Kankra (<i>Bruguiera gymnorhiza</i>), Singra (<i>Cynometra ramiflora</i>) and Kirpa (<i>Lumnitzera ramiflora</i>) were planted during September. Planting was carried out over an area of 1.5ha in three experimental sites of the Sundarban.
5.	Training-Workshop on Nursery and Plantation Technique	Three training programs were conducted with the local farmers on "Nursery and Plantation Techniques" at three Upazillas in three districts adjacent to the Sundarban.

Training/Workshops etc.:

Training Title	Date (From –to)	No. of participants and batch		No. trained		Remarks
		Target	Achievement	Male	Female	
"Nursery and Plantation Techniques"	3-5 January 2012	50/batch 03 batches	150	100	50	Satisfactory

SPGR Monitoring Report of Team -08

Members of the Monitoring Team:

- Dr. Mohammed Shahjahan, CSO, Forestry, BARC
- Dr. Md. Abdus Salam, PSO, Planning and evaluation, BARC
- Dr. Rathi Mahamud Morshed, Monitoring officer, PIU- BARC, NATP

The following projects were monitored by the team:

1. Enrichment and Conservation of Mangrove Ecosystems: BFRI Component.

Objective(s):

- To enrich mangrove ecosystem and determine better silvicultural techniques for major mangrove species.
- To conserve a wider range of mangrove forest gene resources for future generations.
- To develop the appropriate management strategies for sustainable yield and protective services from mangrove ecosystems.

Coordinator/Principal Investigator: Dr. M Masudur Rahman, Chief Divisional Officer, BFRI, Khulna

Sub-project duration: Start: February 2010; Completion : February 2013

Budget Information:

- Total approved cost : 47,99,750/-/-
- Fund released till monitoring: Tk 19,23,767/-
- Expenditure till monitoring:
 - Actual: Tk. 18,96,204.00/-
 - Committed: Tk. -
 - Total: Tk. 18,96,204.00/-

Success story/Problem/constraints and suggestion (if any):

Success story:

1. Nursery were raised with the collected seeds/ propagules of six mangrove species at Bogi Forest Research Station, Saronkhola, Bagerhat; Dhangmari Forest Research Station, Dakop, Khulna and Munshiganj Forest Research Station, Shamnagor, Satkhira
2. Six experimental plantations were raised at six locations in three salinity zones of the Sundarban with the raised seedlings.
3. Twelve thousand seedlings of above mentioned six mangrove species are ready for plantations.



Team observed the laboratory activities

2. Coordinated project on addressing climate change on fisheries sector through community based technology identification and adoption in the fragile aqua ecosystems of Bangladesh: BFRI Component.

Objective(s):

- (i) Develop training manuals on community based fisheries/aquaculture technologies in context to changing climatic conditions
- (ii) Build capacities of training facilitators and community people
- (iii) Provide technical supports to the pilot research initiatives
- (iv) Conduct on-station trials for the similar identified technologies

Coordinator/ Principal Investigator: Dr. Kazi Md. Azimuddin, SSO, BFRI, Kalapara

Sub-project Duration : July, 2011 Completion June 2013

Budget Information :

- a) Total approved cost : 1,01,47,640/-
- b) Fund released till monitoring: Tk 824117 /-
- c) Expenditure till monitoring:
 - (i) Actual: Tk. 1,95,648/-
 - (ii) Committed: Tk. -
 - (iii) Total: Tk. 1,95,648/-

Implementation progress of research activities (Lab./Green house/Field): Not applicable

Technology generation/adoption: Not applicable

Training/Workshops etc.: Not yet done

Procurement Status : Fund not yet received

Success story/Problem /constraints and suggestion (if any):

1. The ponds were re-excavated for conducting experiments
2. Delay fund release



Re-excavating the pond

3. Development of hybrid summer tomato variety, production packages and on farm validation of the developed technologies

Objective(s):

The overall purpose of the project is to increase the production of summer tomato. The major objectives of the project are

- (i) Evaluation and selection of heat tolerant tomato inbreds.
- (ii) Crossing between suitable inbreds to develop heat tolerant tomato hybrid combinations.
- (iii) Evaluation of hybrid combinations during summer season.
- (iv) Marker aided selection of the hybrids for desirable traits.
- (v) On farm validation and selection of location specific summer tomato hybrids
- (vi) Development of summer tomato production technologies.

Coordinator/ Principal Investigator: Dr. Shahabuddin Ahmad, CSO, HRC, BARI

Sub-project Duration: From January 2010 to December 2012

Budget Information:

- a) Total approved cost : 95,15,000.00
- b) Fund released till monitoring: Tk 5699550.00 (up to December, 2011)
- c) Expenditure till monitoring:
 - (i) Actual: Tk. 52,76,991.00
 - (ii) Committed: Tk. 5,00,000.0
 - (iii) Total: Tk. 57,76,991.00

Implementation progress of research activities (Lab./Green house/Field)

Sl. No	Planned major activities	Actual attainments
1.	Collection of heat tolerant tomato germplasm	10 heat tolerant lines collected
2.	Hybridization to developed new hybrids	Developed 26 new hybrids
3.	Field evaluation of tomato genotypes for heat tolerance	Six heat tolerant lines were selected for field trials
4.	Development of summer tomato production technologies (Netting, Pruning method and support system)	A production package is generating
5.	Training program	Four TOT conducted at four locations and 120 persons were trained

Technology generation/adoption:

Five summer tomato hybrids were tested against one released F_1 variety during summer season of 2011 at HRC, BARI, Gazipur. The hybrid WP8 X C51 produced the highest yield followed by WP7 X C51 and FP5 X WP 7. Again the hybrids, WP8 X C51 and WP7 X C51 had the highest individual fruit weight compared to that of other hybrids.

Training/Workshops etc. : 4 TOT conducted at four locations and 120 persons were trained

Internal Monitoring by the implementing Institute

Sl. No	Name of the Person(s) visited	Date of visit (s)
1.	Dr. Md. Abdul Jalil Bhuyan, EX. Director (HRC), BARI	July, 2011
2.	Dr. Md. Khaled Sultan, Director (HRC), BARI	November, 2011

Success story/Problem /constraints and suggestion

From this project PI established a modern Molecular laboratory, which will contribute in the molecular characterization of different vegetables.

PI selected 3 hybrids for next year field validation in respect of fruit shape, disease/ insect reaction and yield.

LIVESTOCK

The Livestock Division of BARC is involved in organizing and managing various research and other related activities for developing the livestock sector in Bangladesh. This division is working to achieve the goal of improving nutritional status of the general mass through cost-effective livestock production for increased supply of animal origin food, supporting increased crop production through providing healthy draft animals and biological manure, and helping the rural poor in the generation of employment, income and fuel supply through profitable livestock rearing.

To carry out the mandated responsibilities of BARC and to full-fill the national need the division is entrusted with the duties of planning, reviewing, prioritizing, approving, monitoring, evaluation, supervision and coordination of the livestock research programs implemented by the relevant NARS institution and other institutions including universities, Department of Livestock Services (DLS) and NGOs. The division is providing training and research support to the NARS institution, DLS, relevant faculties of various educational institutions and NGOs. The division is imparting policy support to the relevant NARS institutes and extension agencies. The division is arranging, conducting and participating in training, meetings, and seminars/workshops. The division is also engaged to support national avian influenza/bird flu prevention and control programs, to recruit scientists/officers in NARS institutes, to support researches of NARS institutes, and to support different activities of Avian Influenza Preparedness and Response Project of DLS and National Agricultural Technology Project- DLS Unit.

Project Development/Project Financing

There were a total of 6 on-going SPGR research sub-projects from Bangladesh Livestock Research Institute (BLRI), Bangladesh Agricultural University (BAU) and Chittagong Veterinary and Animal Sciences University (CVASU). These research projects developed with the leadership/co-ordination of Livestock Division, BARC, were funded under SPGR, PIU-BARC, National Agricultural Technology Project, Phase-1, BARC. Livestock Division, BARC was directly involved for overall coordination, supervision and regular monitoring of these sub-project activities. Out of these 6 sub-projects, one sub-project was coordinated with the involvement of BAU, CVASU and BARC (coordinating unit), and another sub-project was coordinated with the involvement of BAU, BLRI and BARC (coordinating unit). Fund release and brief progress of these projects during the year 2011-2012 are given below.

Bangladesh Livestock Research Institute

Sub-Project Title: Study on milk urea nitrogen (MUN) for improvement of dietary nutrition of dairy cows in Bangladesh

Study sub-title: Evaluation of liquid milk composition of cows considering genotype, lactation, parity, region and season in Bangladesh

Milk is a highly nutritious food which meets the basic requirements of the body. It is highly beneficial for the growth and development of bones. It is also helpful in fighting against diseases like kidney stones, breast cancer, rheumatoid arthritis, migraine headache etc. The daily consumption of milk and milk products per person in Bangladesh is very low (42ml) against the requirement 250ml, if compared to neighboring

countries. An investigation was done to know various factors (genotype, lactation, parity, region, season and company) affecting milk composition in Bangladesh. Milk samples were analyzed using an automated milk analyzer, Lactoster, Funke, Gerber, Germany. It showed



that milk protein and Solid not fat (SnF) percent in milk are significantly highest in Red Chittagong Cattle (RCC) genotype compared to Pabna cattle ($P < 0.05$). There was a significant variation observed in between morning and afternoon milk fat for both the genotypes keeping other constituents similar. It was observed that among the considerable factors for assessing the milk constituents of dairy cows in Bangladesh all has somewhat influence in milk composition except regions and parity. Solids not fat (SnF) ranges 9.01 to 10.93% in all cases that revealed the SnF content in milk must not be less than 8.5% as per milk definition.



Lactoster (Milk analyzer)

Bangladesh Agricultural University

Sub-Project Title: Studies of the Quantitative Trait Loci (QTL) of economic traits in Black Bengal goat

This experiment is being carried out to produce seed stock of Black Bengal goat and to detect Quantitative Traits Loci (QTL) of economic traits in Black Bengal goats. Two flocks of goats are being maintained through proper animal identification and recording system by the contact farmers in Natore and Bandarban district respectively. Growth rate, litter size and kidding

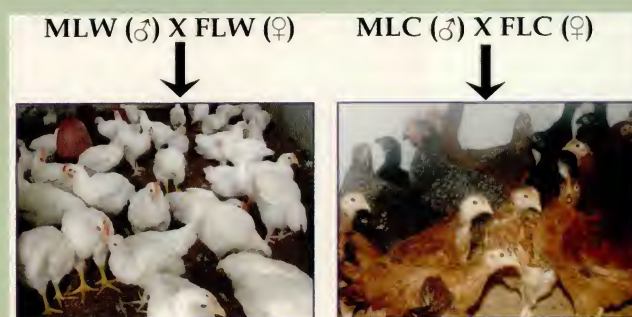
interval, Carcass yield and meat quality are the traits of interest for QTL study and selection criteria. The pure Black Bengal bucks of superior quality to be used as seed stock has been produced in Bandarban and is being used in Natore for control mating. The pure Black Bengal doe (G_1) and cross bred doe (G_2) with proper records of phenotypes has already produced in Natore as per experimental design. The G_2 crossbred doe will be subjected to produce back cross progeny (G_3).

Birth weight of 326 kids (for G_0 and G_1 does for 1st and 2nd parities) in Natore as recorded so far was 1.25 ± 0.01 kg and the growth rate was $49.77 \pm$ gm per day for 90 days. The birth weight of 56 kids of selected does in Bandarban district ranged from 0.80 to 2.0 kg with an average weight of 1.37 ± 0.26 . The litter size in Natore and Bandarban area was 2.00 and 1.91 respectively (considering 1st and 2nd parity together). Kidding interval of G_0 does in Natore was 213.20 ± 3.71 days. Grade and standard have developed to evaluate meat yield and meat quality. The dressing% ranged from 36.16 to 50.32% for the control group in Natore. That ranged from 50.00 to 55.00% for the control group in Bandarban. Genotyping of bucks, does and kids used in this experiment has started. Husbandry of goat rearing of contract farmers has been improved resulted in increase in number of goat per family. Existing molecular genetics laboratory of the department has also been modernized with the financial assistance of this project and is being utilized by the post graduate of the department.

In conclusion, it may be said that Field units with experimental animals are running to a positive direction to fulfil the desire farmers.

Sub-Project Title: Approaches to develop broiler sire and dam lines from available genetic resources

A selection study was undertaken to develop broiler sire, male line white (MLW) & male line colored (MLC) & dam, female line white (FLW) & female line colored (FLC) to produce day old broiler chicks. The male lines



BAU-Bro White (42 days of age) BAU-Bro Color (42 days of age)

were selected on 5week body weight, while female lines were selected on index value using 6week body weight, up to 35 weeks egg number & 32 week egg weight. The results of 2nd generation selection study indicated that the male lines gained 40-50g/ generation, while female lines egg production improved by 3-4 egg/ generation

and egg size by 13-15g at sexual maturity & 4-6g at 32 week. The selection of broiler parents improved brooding & growing period livability. The broiler produced through line crosses of selected male & female lines attained 1179 & 883g at 6 weeks of age with FCR 1.67 & 1.91 in white & colored strain respectively. The livability was 98-99% with high dressing yield, 75-76% in white & colored strain respectively.

Sub-Project Title: Production of HYV vis-a-vis Indigenous seed bulls to support Smallholder dairying in Bangladesh

Door to door identification of high producing elite cows & heifers of various HYV, registration with unique identification system and their performance were



(A) A registered cow, (B) Mastitis testing using milk samples

recorded maintaining Herd Books. Registered elite cows/ heifers were bred with superior known merit semen on priority basis. Concurrently, contractual agreement with owners, registration of progeny calves were born (24 calves born to date) using known merit semen by the project and registered females were tested to ascertain their freeness from major diseases e.g. mastitis, TB, brucellosis and parasitic infestation on regular basis. Farmers' training, routine vaccination and deworming of registered animals and monitoring of field



Calf identification and registration

data collection were in pursued. To create awareness, dissemination of need-based information among scientific community and other stakeholders including farmers, a workshop on the value and procedure of seed bull production was held. To identify potential seed male calves with good dairy genetics and mother's clean reproductive profile, biological data on registered cows and their progeny, close monitoring of their health status were critically maintained, analyzed and results were being compiled for placing before "Seed Bull Certification Committee" to decide and declare superior quality seed bulls for the industry were in progress.

BARC-BAU-CVASU (Coordinated):

Sub-Project Title: A Coordinated project on the Surveillance of Important Infectious, Zoonotic and Emerging Diseases of Livestock and poultry in Bangladesh

BAU Part:

Diseases cause major loss in the livestock production because quick confirmatory diagnosis is absent here. This research project will help adopting quick confirmatory diagnosis protocol for certain infectious, zoonotic and emerging diseases and some surveillance data which will help in formulating future control and prevention protocol for those diseases. A total number of more than 2000 (Two Thousand) animals were examined and more than 500 (Five Hundred) samples were collected from through Bangladesh. The samples were 276 for suspected Foot and Mouth Disease (FMD), 57 for Tuberculosis (645 animals were injected intradermal tuberculin PPD for tuberculosis diagnosis, 24 found positive), 51 for



Leishmania (13 red foxes, 25 dogs, 10 goats and 3 cattle), 2 for anthrax, 79 for Avian Influenza, 150 for Blood protozoa and more 23 for unknown etiology. The collected samples are being analyzing in the laboratory. 10 positive samples of FMDV (8-Sero Type 'O' and 2-sero 'Type Asia-1') were sequenced to understand the genetic characteristics, 9 Tuberculosis positive samples and 2 Leishmanial positive samples also characterized for same purpose. Protocols for rapid and confirmatory diagnosis of FMD, Tuberculosis, Leishmaniasis, Brucella, Blood protozoa, Avian Influenza, Duck Plague, Duck Anatipestiper, Marek's Disease, and Duck Cholera were adopted. All those helps in future control and prevention of these diseases in both animals and human.

CVASU Part:

Among the animal diseases Rabies and among the poultry diseases Infectious Laryngotracheitis (ILT), Infectious Bronchitis (IB), Chicken Infectious Anemia, Lymphoid leucosis, Mycoplasmosis and a retrospective survey of the hospital cases on the prevalence of bacterial diseases in Chittagong have been selected for investigation through CVASU part of the sub-project.

Rabies:

Rabies detected in a Wildebeest from Bangabandhu Safari Park, Dulahazra, Cox's Bazar. Methodology: Positive for-

- Rapid immunochromatographic test using BioNote® Rabies detection kit from the brain tissue specimen (from brain stem and medulla oblongata)
- Reverse Transcriptase polymerase chain reaction (RT-PCR) using INTRON® Rabies diagnostic PCR kit

Infectious Laryngotracheitis (ILT):

A total of 300 blood samples were collected from 20 commercial layer farms in Chittagong. All samples were tested with antibody detecting ELISA. Around 19 % samples have been found sero-positive for ILT. Infection was found higher during winter (21%) compared to rainy season (17%) and summer (10%).

Infectious Bronchitis (IBV):

Blood and organ (kidney, lung, and trachea) were collected from 10 breeder farms (from 200 birds) of Chittagong. After inoculation of eggs 65 samples (32.5%) were found positive for IB. Among them 35.71% in the broiler breeder farms and 25% in the layer breeder farms was found positive. From the positive egg inoculation samples 46 were subjected to RT-PCR from where 27 (58.69%) were found positive.

Lymphoid leukosis (LL)/Avian leukosis:

Randomly 24 blood samples were collected from the flock suspected of avian leukosis and out of them 45% buffy coat samples and 25% serum samples were positive for the presence of ALV.

Chicken Infectious Anemia (CIA) and Mycoplasmosis:

Collection of samples for Chicken Infectious Anemia and Mycoplasmosis is going on.

Bacterial Diseases:

Retrospective survey of the hospital cases on the prevalence of bacterial diseases is progressing well.

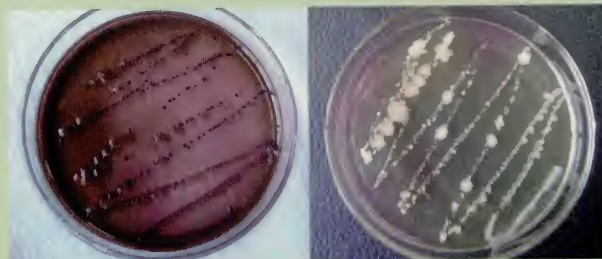


Inoculation of 9-11 days chicken embryo for isolation of IBV virus from field sample

Around 200 samples (liver & spleen) have been collected from dead bird after postmortem in the SAQTV hospital, CVASU. Out of 200 samples, 53 samples tested, 40 have been found positive for colibacillosis and 5 for staphylococcus. Rest of the samples found negative for any bacterial diseases.



Molecular detection of Infectious Bronchitis Virus



E. Coli in EMB Agar Staphylococcus in manitol salt agar

BARC-BAU-BLRI (Coordinated):

Sub-Project title: Development of an effective PPR vaccine seed from local isolate and its molecular characterization

The present study was proposed to isolate and characterize the prevalent field strains, molecular characterization, and development of a suitable vaccine



PPR virus infected Vero cell in Tissue culture Flask

seed. Field outbreaks are being investigated by isolation of virus in Vero cell, by RT-PCR and sequencing. So far, twelve field isolates are available in the repository. Molecular characterization (partial sequence of F and N genes) of 11 field isolates completed (Gene Bank Accession available). The similarity of N and F genes among all the Bangladeshi isolates were 94.5-99.6% and 98.7-100%, respectively and clustered under lineage 4. Two unique amino acid substitutions were found on N protein of recent lineage IV Bangladeshi isolates. Three (3) isolates are being passaged in Vero cell and so far were 22nd passage completed, CPE "rounding &

clumping of Vero cells" produced at 3rd day onward (Fig. 1 & 2). Partial sequence of 9th passaged virus completed. Some early substitution noticed. Work is in progress.



Virus infected Vero cell; rounding of infected cell

Coordination of Core Research Activities of BLRI

The Livestock Division of BARC is responsible for scrutinizing and coordinating the core research programs of Bangladesh Livestock Research Institute (BLRI) and devoted itself performing the following duties:

- Reviewed the annual research programs and suggested improvement avoiding wasteful duplication.
- Provided technical support and guidance based on national policy and demand in planning the institute's research programs.
- Done field level monitoring and evaluation of the core research projects to provide technical support and to suggest further improvement.
- Participated in the review workshops, board of Management meetings, different technical committee meetings, recruitment of scientists and other staffs of the institute.
- Done mid-term evaluation of the on-going research projects.

Annual evaluation of the completed research projects was done.

Research Highlights of BLRI

Among the various other agencies and institutes, Bangladesh Livestock Research Institute (BLRI) is the only NARS institute working with the mandate of identifying and solving the basic problems of livestock development through research and demonstration in the country. BLRI, with its other various jobs is working to develop

- Suitable methods for quick diagnosis and treatment of various livestock diseases;
- Appropriate technologies for production of suitable vaccines and biologics;
- Appropriate health management and control methods for different livestock and poultry diseases;
- Appropriate food hygiene and safety technologies and herbal medicinal drugs;
- Suitable breeds of livestock and poultry for increasing production of milk, meat and eggs;

- Suitable feeds and fodder varieties with their production, improvement and preservation techniques;
- Suitable storage facilities and marketing systems for the livestock products and byproducts.

With the above-mentioned research mandate BLRI conducted a total of 28 research projects/programs during the year 2011-2012. Research highlights of some these projects/programs are given below:

1.0 Breeding for the Improvement of Indigenous Chickens of Bangladesh: Evaluation of performance of First Generation of Indigenous Chicken

Pure breeding is necessary for the conservation and improvement of indigenous chicken genetic resources. Present research is being undertaken to evaluate the performance and expected response to selection of first generation (G_1) of three indigenous chicken genotypes. A total of 1439-day-old chicks comprising of 3 genotypes namely Naked Neck (NN), Hilly (H) and Non-descript Desi (ND) were hatched for this study. In first generation, selection was practiced on body weight at 8-weeks of age, on the basis of their breeding value. At 8, 10 and 12 weeks of age, six birds from each genotype were slaughtered to analyze the meat yield traits. Despite of significant difference in live weight between ages at slaughter, dressing percent (65.87-66.89 %) of different ages was similar but was affected by genotype. As a result of selection, body weight at 8 weeks of age was expected to improve by 58.98 vs. 11.50; 81.56 vs. 40.91 and 53.81 vs. 15.82 g; respectively for ND, H and NN males and females. In terms of productive traits (chick weight, body weight at difference stages, daily body weight gain, cumulative body weight gain, body weight response at 8 week) H genotype was superior and NN genotype was superior for dressing percentage, early sexual maturity and mortality rate. These findings give an impetus for continuing the pure breeding research of native chicken for more generations.

2.0 Study on Mitochondrial DNA (mtDNA) Diversity in Indigenous Chicken of Bangladesh

A total of 100 unrelated chicken blood samples (35 HI, 35 ND and 30 NN) were collected from both BLRI native stock population and Nikhongchari regional station chicken population. Samples also included from Manikganj, Sirajganj, Kishoreganj, Gazipur, Rangamati, Bandarban, Mymensingh and Sherpur districts. Genomic DNA was extracted from filter paper using genomed tissue DNA spin kit (GmbH, Germany) and the concentration of extracted DNA was checked on 0.8% agarose gel (Image 1). The 710 bp of the mtDNA D-loop region was amplified by PCR using the following primer; F- GGCTTGAAAAGCCATTGTTG and R-CCCAAAAAGAGAAGGAACC. The PCR primer was designed from chicken reference sequence

Data analysis will be performed later on after having DNA sequence information.

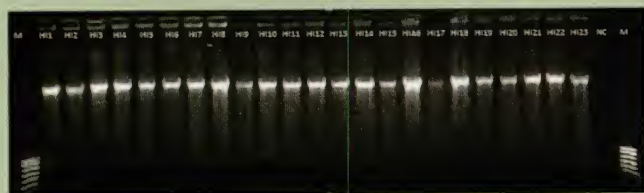


Image 1 represents the quality of extracted DNA on 0.8% agarose gel from Hilly chicken using Genomed tissue DNA extraction kit. M, the size marker; HI, Hilly chicken and NC, negative control.

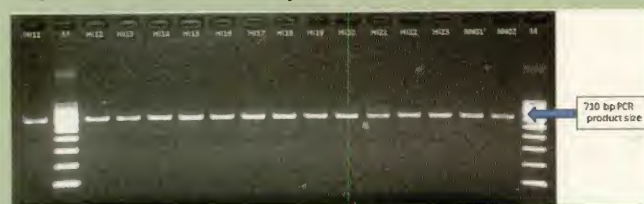


Image 2 shows the amplicon size of mtDNA PCR product on 2.0% agarose gel. M, the size marker; H1, Hilly chicken and NN, Naked Neck chicken.

Bangladesh Livestock Research Institute started a quail breeding program to develop a meat type quail.

4.0 Study on antibiotics and growth promoters in poultry

Considering the present situation of drug abuse and paucity of information on these practices three studies (Training impact on use of additives and drugs, drug residue detection in broiler meat at in-situ and ex-situ condition and validation of declared withdrawal periods of antibiotics) were conducted under this project. Training and monitoring can play a vital role in changing the existing malpractice of use of drug and can minimize the poultry production cost of farmers who have not practical knowledge about above mentioned practice. Observed drug residue level in poultry meat in-situ (broiler farm) and ex-situ (market) condition were very high which is not safe for human health. A high tissue concentration of different broad-spectrum antibiotics was found in broiler meat in market places which was similar in broilers of control study where antibiotics were administered and meat was analyzed between 1-3 days. Validation of declared withdrawal periods of antibiotics shows non agreement on recommended withdrawal period. Drug residue level in ex-situ (market) condition was very high than in-situ (broiler farm) condition. Training and awareness building for using antibiotics in chicken to produce safe poultry products may play important role to overcome the situation.

One hundred and eight day-old chicks of native chicken of Hilly areas of Bangladesh were studied for 10 weeks of age to compare their growth and feed efficiency under two feeding levels. The feeding levels were 22.23%CP and 3153 Kcal/Kg ME; and 19.35% CP and 2964 Kcal/Kg ME. The body weight of the birds at 8 and 10 weeks of age were 699 and 492; and 937 and 759 g ($P<0.01$) respectively. The per bird feed consumption were 1802 and 1483; and 2622 and 2351g ($P<0.05$) and the corresponding feed conversion rate were 2.69 and 3.20; and 2.89 and 3.22. The mortality of the birds were 1.85 and 0; and 1.85 and 1.85 percent ($P>0.05$). It may be concluded that native chicken of Hilly areas have potentiality for meat production and can utilize high protein and high energy diet more efficiently.

Genetic study was completed among three native sheep populations of Bangladesh (Barind, Jamuna River Basin and Garole sheep). Results showed that Barind and Jamuna River Basin sheep belong to same genetic group and both of them differed from Garole sheep.

An agronomic trial was conducted with five Napier (*Pennisetum purpureum* var.) cultivars including one check (BLRI Napier- hybrid) collected from Japan and

Viet Num at the red soil Modhupur tract of Savar with objectives to investigate the biomass yield, morphological characteristics, botanical fractions, nutritive value and in-sacco dry matter degradability. The results indicated that the CP content was significantly higher ($p < 0.05$) in MERKERON and lowest in BLRI N. hybrid. There was no significant difference in CP among BLRI N. hybrid, N.Vietnum, Napier Japan and WRUK-WONA. The ADF content was higher in BLRI N.hybrid compared to other cultivars. The lower ADF value in WURK-WONA and MERKERON corresponded to significantly ($p < 0.05$) higher *In sacco* DM degradability at 72 hrs. of incubation compared to N.Japan, BLRI N. hybrid and N. Vietnam, respectively. The results so far obtained revealed that in terms nutritive values, ADF and DM degradability the WRUK-WONA and MERKERON are better than other cultivars.

8.0 Study on feeding effect of shoti, wheat and soybean based milk replacers on growth performance of calves.

The present study was undertaken to develop milk replacers by keeping alternative ingredients and compare its feeding effect with shoti based MR. A total of 24 local calves (BLRI Cattle Breed-1; 20 calves and Red Chittagong Cattle; 4 calves) of about 6-10 days of age were selected and divided in four groups; having six (6) calves in each. A limited suckling with feeding whole milk considered as control (T_0), suckling along with feeding of wheat, shoti and soybean based milk replacer considered as treatments and denoted as T_1 , T_2 and T_3 respectively. No significant difference ($p < 0.05$) was observed in average daily weight gain (ADG) among the treatment groups. The feed conversion efficiency (FCR) was relatively better ($p > 0.05$) in calves those fed shoti and soybean based MR compared to calves fed wheat and control diets. The processing/ preparation cost per kg MR was increased Tk. 41.00-43.00 in T_2 group than that of T_1 and T_3 groups. The feeding cost per calf per day was reduced Tk. 52.00 Tk. 29.00 and Tk. 48.00 in T_1 , T_2 and T_3 , respectively than that of T_0 group (Table 3). Results considering for both FCR and per day feeding cost, it indicates that T_2 and T_3 diets i.e. shoti and soybean based MR were effectively maintained growth of calves compared to milk fed calves.

9.0 Study on feeding plane of nutrition, intake and growth performance of different age groups of RCC bulls.

A total of 15 RCC bulls of four age groups were dewormed and distributed in four groups. The age groups were 9-10 months, 15-16 months, 21-22 months and 27-28 months having mean live weights of 57.75, 86.40, 112.00 and 160.00 kg, respectively. All the animals were housed in individual pen and Napier silage was supplied for the first 2 months of experiment and followed by

Napier green grass for another one month. Animals were supplied concentrate mixture @ 1 per cent of their respective body weight. The results indicated that total DM intake/ 100 kg body weight was significantly higher in 15-16 months age group of animals followed by 9-10, 21-22 and 27-28 months age group, respectively. The average body weight gain (g/day) was significantly higher in 27-28 months age group and the lowest in 9-10 months age group of bulls. The body weight gain didn't differ significantly ($p > 0.05$) among the age groups of 15-16, 21-22 and 27-28 months, respectively. In terms of FCR, it observed that the significantly ($p < 0.05$) lower FCR was found in 9-10 months age group and higher in 27-28 months age group.

10.0 An Economic Analysis of fodder production model under Meherpur district

To investigate the economic benefit of the fodder model, BLRI was conducted a survey covering three Upazilas of Meherpur district namely, Meherpur Sadar, Gangai and Mujibnagar. The survey was conducted randomly on 33 Napier cultivators, 18 middlemen and 64 fodder users (dairy keepers). The survey results indicated that the average number of cattle, goat and sheep per household in Meherpur district were 2.12, 3.19 and 0.00, respectively. In 2011, the average coverage of Napier cultivation per producers in this region was 1.94 bigha (range 0.00 – 17 bigha) and its' increased at a rate of 15 percent in 2012 and at present, the average coverage about 2.24 bigha per household for Napier cultivation. During summer and winter, the prices of a bundle of Napier grass were vary from Tk. 3.00-4.00 and 5.00-6.00, respectively once farmers sell it directly in market. Farmers, however, received relatively lower price if they sell it to middlemen and the price vary from Tk. 2.0-2.50 and Tk. 3.50-4.00, respectively during summer and winter. The total variable cost involvement for Napier production, gross income and net profits from per bigha per year was Tk. 24,240, Tk. 63,000 and Tk. 38,760, respectively. Per day a middlemen earned Tk. 638 (Range Tk. 200-1200) through selling on an average 1.28 metric ton/640 bundles (range bundles 150-1500) grass to dairy keepers. Per day a dairy keeper purchased Napier grass on an average of 9.25-bundle/19 kg at the expense of Tk. 36.00. It may be concluded that, fodder model in Meherpur is a profitable model and all the stakeholders involved under this model getting economic benefits.

11.0 Effect of genotype, lactation and season on milk urea nitrogen, blood urea nitrogen and milk composition of dairy cows

Milk is highly beneficial for the growth and development of bones. It is also helpful in fighting against diseases like kidney stones, breast cancer, rheumatoid arthritis, migraine headache etc. An investigation was done to determine the existing status of milk urea nitrogen (MUN) as well as blood urea nitrogen (BUN) of local

and crossbred cows in the two areas (namely Noakhali and Jessore) and to determine on-farm factors that affect MUN contents, forty cows having 20 native cows (local cow) and 20 crossbred cows (Local × Holstein-Friesian) origins (genetic quality) differing in lactation yield were selected from this location in dry season (winter) and wet season (summer) of the country. BUN and MUN in dry season (38.60 mg/dl and 37.28 mg/dl respectively) was significantly ($P < 0.01$) lower than in wet season (33.53 mg/dl and 31.91 mg/dl respectively). The effect of lactation stage (100 DIM and 100 DIM) on live weight (272.7 & 293.7 kg respectively) differed significantly ($P > 0.01$) but no significant difference was observed in BCS at 100 DIM (2.51) and 100 DIM (2.70). The effect of lactation stage had no significant influence (100 DIM and 100 DIM) on milk yield (5.33 kg and 4.61 kg, respectively) and 4%FCM (5.10 kg and 5.19 kg). The milk constituents of dairy cows in Bangladesh has influenced by genotypes, milking time, stage of lactation except regions and parity. Solids not fat (SnF) ranges 9.01 to 10.93% in all cases that revealed the SnF content in milk must not be less than 8.5% as per milk definition. The MUN depends on plane of nutrition of cows, seasons, genotypes and stages of lactation which is revealed in both the regions.

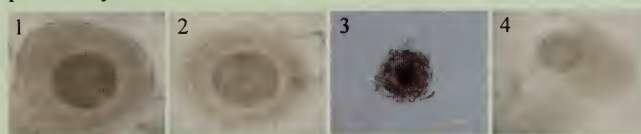
12.0 Community based milk preservation and processing technology for entrepreneurship development & employment opportunity

As per Economic Review (2011), the present milk production is about 2.75 MMT and out of which only 5 per cent milk processed in the country. The small-scale dairy farmers compel to sale their milk in middle men or *Foria* who are harvesting the maximum benefit from milk selling. The above view in mind an attempt was to contact with a private entrepreneur of Bangladesh who has the capacity to develop prototype milk preservation & processing unit with available raw materials in the country. After that, an innovative sharing of knowledge was made for development of small-scale milk preservation & processing unit. The economic analysis of installation small scale pasteurization and cooling unit (capacity 300 litres milk/day) revealed that an entrepreneur can earn more than 5 (five) lac. Net income per year as by investing about Tk.6 lac. Through installation of small scale milk preservation and processing unit. It was also revealed that using a small-scale dahi/curd making incubator (capacity 50 kg/day) an entrepreneur can earn Tk. 2,885 per day as by investing Tk. 4,115.

13.0 Applications of ovum pick up based in vitro embryo production system (OPU-IVF) for multiplication of high yielding Red Chittagong cattle (RCC) at BLRI research farm

Biometry of oviduct, uterine body, cervix and ovary were completed. Moreover, number of follicles,

aspirable oocytes and number of good quality oocytes per ovary were evaluated.



Photograph showing grading system of bovine immature oocytes: (1) Grade-I oocyte; (2) grade-II oocyte; (3) grade-III oocyte; (4) grade-IV oocyte.

14.0 Study on genetic diversity of BLRI cattle breed - 1 (BCB-1) using mtDNA and Microsatellite Markers

Genetic study was completed among BCB-1, Red Chittagong cattle and Progenitor cattle of BCB-1 (native cattle of Sirajganj and Pabna districts). Result showed that BCB-1 has close relation with its progenitor cattle but differed from Red Chittagong cattle.

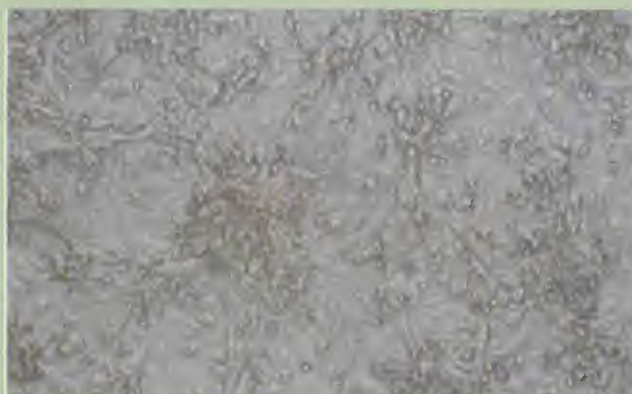
15.0 Avian Influenza risk mapping, molecular characterization and gene cloning of viruses

Highly pathogenic avian influenza (HPAI) subtype H5N1 is a deadly zoonotic pathogen. Avian influenza was first detected in Bangladesh in February 2007 and has spread to at least 51 of the country's 64 districts. More than 2.00 million chickens were culled by May 2012. Till May 2012, 546 outbreaks have been recorded of which 487 in commercial chickens and 57 in backyard chickens. There have been six epidemic waves of AI outbreaks in Bangladesh since March 2007 and another new wave seems to have started. At least three clades of H5N1, HPAI virus, namely clade 2.2, 2.3.2.1 and 2.3.4, have been circulating in Bangladesh. Clades 2.3.2.1 and 2.3.4 have been newly introduced in poultry of Bangladesh in 2011 in addition to the clade 2.2 already circulating since 2007. All sequenced isolates of 2012 belong to clade 2.3.2.1. Clade 2.3.2.1 has been circulating in migratory birds since 2010 before their detection in domestic poultry and crows in 2011. Four out of eight full-length genome segments of a H5N1, HPAI strain have been cloned and sequenced successfully. Phylogenetic analysis based on full-length sequence of HA, M, NP and NS genes shows that Bangladeshi isolates are closely related to isolates from other South Asian countries. Development of a risk map model of HPAI spread in Bangladesh is in progress.

16.0 Isolation and molecular characterization of PPR viruses prevalent in Bangladesh and selection of new vaccine candidate

The Peste des Petits Ruminants (PPR) is a highly contagious viral disease of small ruminants especially for sheep and goat, which is characterized by high fever, necrotic stomatitis, discharges (nasal, ocular and oral), pneumonia, diarrhoea and death. In a susceptible herd, morbidity may be up to 100% with a mortality of 80-90%. Vaccination is one of the effective tools to control this disease. To replace the present vaccine seed which is not found effective against circulating PPR virus the project

was taken with the following objectives: Isolation and molecular characterization of PPR viruses prevalent in Bangladesh and attenuation of some selected isolates.



Vero cell infected with PPR virus, 48 hours

Field isolates showing good CPE in cell culture, revealed maximum homology among the field isolates. At least 6 isolates showing good CPE and adaptation in Vero cell culture have been selected for new vaccine candidate. The works on attenuation of local isolates for the development of new vaccine candidate are in progress. So far 18 passages have been completed.

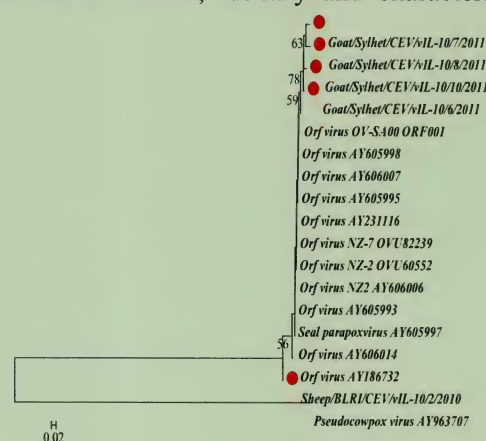
17.0 Investigation into emergency outbreak of animal and poultry diseases in Bangladesh

Nationwide FMD outbreak was recorded from November to May where three FMD serotype (serotype O, Asia 1, and A) were recorded. Three outbreak of FMD were identified in Savar Military Farm. The 1st outbreak in the month of November where about 20% cattle were infected by FMD, serotype “Asia 1” virus. 2nd outbreak of FMD was occurred in late February with serotype “O” where about 10% cattle were affected. 3rd outbreak identified with serotype “A” FMD virus in the month of May. At least three clades of H5N1 HPAI virus, namely clade 2.2, 2.3.2.1 and 2.3.4, have been circulating in Bangladesh. Clades 2.3.2.1 and 2.3.4 have newly been introduced in poultry of Bangladesh in 2011 in addition to the clade 2.2 already circulating since 2007. Sporadic anthrax outbreak was also detected from Sirajganj and Pabna districts from May to June. No other major disease incidence has been found in this year.

18.0 Isolation, identification and characterization of the strains of contagious ecthyma virus from goats and sheep

Contagious ecthyma (CE) is one of the most widespread viral diseases; primarily affect goat and sheep although it has been reported from human, reindeer, musk ox, dog, cat, red squirrel etc. The disease is caused by DNA containing contagious ecthyma virus (CEV). The disease not only has an economic impact on farmers but also has a considerable negative effect on animal welfare. In Bangladesh the disease is prevailing and symptomatic

diagnosis was done earlier. However, the epidemiology of the disease is not study yet. Present study was aimed to know the epidemiology of the disease and to isolate, identify and characterize the



Phylogenetic analysis of CEV isolated from Goat and Sheep in Bangladesh. An un-rooted neighbor-joining tree of nucleotide sequences of viral vIL gene was generated followed by 1000 replications of bootstrap re-sampling. Bangladeshi isolates were marked by colored circle.

virus. A total of 164 households (20 from Mymensingh Sadar Upazilla, 80 from Savar Upazilla and 64 from Chuadanga Sadar Upazilla) were surveyed with a structured pre-tested questionnaire. Besides, 35 samples (scab materials) were collected from clinically affected and/or suspected goats. The disease was found to vary according to age and sex of the animal, temporally and spatially. Overall morbidity, mortality and case fatality was 23.89, 1.02 and 17.65%, respectively. Highest morbidity (29%) was found in goats of 7 months-1 years aged group and lowest (2.05%) in goats of 2-3 years or more. Females were found more susceptible than male. About 79% goats were found affected during January-March, 2012 and 21% during October-December, 2011. Of the tested samples 85.71% (30/35) samples were found positive by PCR. For molecular characterization VIL gene of 5 different CEV were sequenced. One virus obtained from sheep and four from goat. Sheep virus found to have 95.2-97.2% homology with goat viruses sequenced in this study. Goat viruses were found closely related to each other (Fig. 1). The identity among the goat viruses ranges from 97.2-98.6%. From Gene Bank, Orf virus strain OV-SA00 (Accession No. AY386264) was found most closely related (96.94% identity) to Bangladeshi isolate. The distance between Bangladeshi sheep isolate and isolate from Gene Bank was found only 3.06%. Phylogenetically goat isolates clustered separately from sheep isolate.

19.0 Study on efficacy, potency and safety of BLRI developed enterotoxaemia toxoid

In order to evaluate the efficacy, potency and safety of the BLRI developed enterotoxaemia toxoid, fresh toxin was prepared from the local toxigenic strains of

Clostridium perfringens type D. The strength of the prepared toxin was determined by 'Absorbance Assay'. The toxicity and lethal dose (LD) of the toxin were determined by using adult mice. Then, toxoid was prepared against type D enterotoxaemia and its efficiency was tested in mice. The calculated concentration, oral LD₅₀ and LD₁₀₀ for mice of the prepared toxin were as 14.4 mg/ml, 21.6 g and 36 g, respectively. BLRI developed toxoid offered significant protection and found effective in 92.5% mice experimental challenges. Therefore, BLRI developed enterotoxaemia toxoid could be an effective tool to prevent and control enterotoxaemia in sheep and goat, though it needs to be validated in natural hosts.

RESEARCH SUPPORT

A. Review of project proposals for operational fund:

A new project under BARC's Research Grant, entitled "Isolation, identification and characterization of the etiological agent of infectious coryza in chicken and development of its effective remedial measures" was reviewed this year. Two SPGR sub-projects entitled "Study on the prevalence of parasites of economic importance in cattle calves in coastal and hilly regions of Bangladesh" and "Isolation and molecular characterization of egg drop syndrome (EDS-76) virus in Bangladesh" were also reviewed this year. Research project proposals of BLRI were reviewed in July, 2011.

B. Coordination and Review meeting/workshop: A

coordination meeting (27 October 2011) were held in Livestock Division, BARC on the SPGR project "A coordinated project on the surveillance of important infectious, Zoonotic and Emerging Diseases of Livestock and poultry in Bangladesh". As a member of Technical Committee of BLRI, attended the committee meeting in February, 2012 to review the progresses of on-going research projects and to evaluate & approve new project proposals of BLRI.

C. Monthly/Quarterly/Half yearly/Annual progress

evaluation (2011-12): Monthly, quarterly, half yearly and annual progress reports of six NATP-SPGR projects of BLRI, BAU, CVASU and BARC submitted in 2011-12 were evaluated.

Support to Avian Influenza/Bird Flue Prevention and Control Programs

As a member of the National Avian Influenza Technical Committee under the Ministry of Fisheries and Livestock, suggestions and technical support were given directly by the Livestock Division of BARC. As a member of different committees of Avian Influenza Preparedness and Response Project of DLS, all sorts of supports were also given by the division to operate the project activities.

Support to Scientists/Officers Recruitment and Research of BLRI

As a member of the recruitment committee for

recruitment of scientists/officers of BLRI, support was given directly by the Livestock Division to recruit best scientists/officers for BLRI. As a member of the technical committee and Expert Committee, support was given directly by the division through evaluation of the progresses of different approved research projects and approval of new project proposals of BLRI in July, 2011 and February, 2012. An International Workshop on "High Yielding Dairy Breed Development in Bangladesh", organized by BLRI during 28-29 September 2011 was attended. BLRI research review workshop 2011-12 held on June 24-25, 2012 was attended. Support was also given to other activities of BLRI.

Support to National Agricultural Technology Project: Phase-1, DLS Part

As a member of different committees of the project, support was given to operate the different project activities throughout the year.

Support to Policy Making Programs Related to Livestock

As a member of the expert committee, support was given directly by the Livestock Division in policy making programs related to livestock in the Ministry of Fisheries and Livestock, DLS, BLRI and other organizations. Support was also given by the division in policy making activities related to livestock through organizing workshop/seminar/ meeting.

Support To MIS/ICT Programs

As a member of the committee for BARC MIS/ICT cell, support was given through review of MIS/ICT's status in different NARS institutes including BARC by arranging meetings/seminar/ workshop. Support was given to develop MIS/ICT programs in different NARS institutes including BARC.

The division performed several other routine activities that included the followings:

- Annual progress evaluation of the research projects;
- Preparation of annual report 2010-11 (done in December, 2011), annual work plan 2011-12 (done in July 2011) and various other documents, etc.;
- Review of different documents and preparation of comments on them: "Animal Feed Regulations-2012" was finalized at a meeting held on 03-5-2012 at the Conference Room of the Ministry of Fisheries and Livestock (MOFL) with Secretary, MOFL in chair. In previous year, the draft "Animal Feed Regulations-2010" was reviewed. The draft regulations with comments and corrections made in the draft regulations were sent back to MOFL in June 16, 2011. Draft "Animal and Animal Product Quarantine Regulations-2012" sent from MOFL was reviewed and this

with comments was sent back to MOFL. Draft “Creation of Livestock Pasture Land, Conservation and Management Act-2012” sent from MOFL was reviewed and this with comments was sent back to MOFL.

- Dissemination of technical knowledge as a resource speaker in seminars and training programs and rendering technical support to various organizations and agencies as an expert member and resource person: Technical knowledge was disseminated as a resource person/expert in seminars/meetings organized by DLS/BLRI/MOFL/KGF,
 - to prevent and control avian influenza (Bird flu), etc.
 - to transfer livestock technologies to farmers level.
 - As a member of Expert Committee, to evaluate the progresses of different approved research projects and to approve new project proposals of BLRI in July, 2011 and February, 2012.
 - As an Expert member, to evaluate the progresses of different approved research projects and to evaluate new project proposals of KGF.
- Providing technical support to other divisions of BARC;
- Providing technical support to different national and international organizations like BAU, CVASU, SAU, SAC, FAO, ILRI, etc.:
 - Technical support was given as a member of National Steering Committee of the BAU part of the UNEP-GEF-ILRI Asia Project on “Development and Application of Decision Support Tools to Conserve and Sustainably Use Genetic Diversity in Indigenous Livestock and Wild Relatives” to operate the project activities in Bangladesh.
- Monitoring and evaluation of the various projects: Activities of the livestock related sub-projects implemented under SPGR, PIU-BARC, NATP Phase-1, were monitored from 14-1-2012 to 16-1-2012. Core research/Technology transfer activities under Research Grant of BARC were also monitored.
- Participating different Agricultural (including Livestock) workshops/seminars/meetings/ trainings in BARC and elsewhere:
 - Participated successfully a total of 10 different Agricultural (including Livestock) workshops/seminars/meetings/trainings in BARC and elsewhere.
- Other unforeseen jobs (if any), relevant to the development of livestock that may emerge during the plan period:
 - Attended ‘World Food Day’ programs, National and International Poultry Exhibitions, etc.

FISHERIES

Project development and financing

The Fisheries Division of BARC supported a number of research activities, workshops, seminar and training programs to enhance regular activities in the field of fisheries research and development during the period of July 2011-June 2012. The division funded, reviewed and monitored different research projects of Bangladesh Fisheries Research Institute (BFRI), Bangladesh Agricultural University (BAU), Dhaka University (DU), Sylhet Agricultural University (SAU) and Sher-e-Bangla Agricultural University (SAU) during the reporting period.

The funding sources were revenue and SPGR, NATP Phase I. A total of 09 projects were funded during the reporting period. Among those, 05 projects were funded under the regular revenue budget and the remaining 04 projects were funded from SPGR, NATP Phase I.

The projects funded under regular revenue funding provision of BARC are listed below:

Project Title	Name of the PI
Study of reproductive endocrinology of mud eel <i>Monopterus albus</i> for artificial propagation	Dr. Harunur Rashid, Associate Professor, Department of Fisheries Management, BAU, Mymensingh
Production of genetically male tilapia by identification of YY super-males using microsatellite DNA markers	Dr. Md. Samsul Alam, Professor, Department of Fisheries Biology & Genetics BAU, Mymensingh
Development of breeding fry rearing techniques of endangered Tengra, <i>Mystus vittatus</i> and Gulsha, <i>Mystus cavasius</i> .	Dr. Md. Mukhlesur Rahman Khan, Professor, Department of Fisheries Biology and Genetics, BAU, Mymensingh
Study on fish disease and health management in rural aquaculture	Dr. Md. Ali Reza Faruk, Professor, Department of Aquaculture, BAU, Mymensingh
Development of breeding techniques of Air (<i>Sperataaor</i>)	Dr. Mahmud Iqbal, Assistant Professor, SAU, Sylhet

The projects funded under SPGR, NATP Phase I are listed below:

Project Title	Name of the PI/Coordinator
Gene banking of improved brood stocks of Indian Major carps (catla, rohu and mrigal) and development of breeding technique of three threatened species (mohashol, basgair and baim).	Dr. Md. Fazlul Awal Mollah Professor, Department of Fisheries Biology & Genetics, BAU, Mymensingh
Assessment of aquatic pollution and biodiversity of some lakes of Dhaka City.	Dr. Md. Niamul Naser, Professor, Department of Zoology, DU, Dhaka
Investigation into fish diseases and economic losses due to disease incidence	Dr. Nazneen Begum SSO, Freshwater Station, BFRI, Mymensingh

Project Title	Name of the PI/Coordinator
Coordinated Sub-project on Addressing Climate Change on Fisheries Sector Through Community Based Technology Identification and Adoption in the Fragile Aqua Ecosystems of Bangladesh.(BARC Component, BFRI Component and SAU Component).	BARC Component Dr. M. Kabir Ikramul Haque, MD (Fisheries), BARC BFRI Component Dr. Kazi Md. Azimuddin, SSO, Riverine Sub-Station, BFRI, Khepupara. SAU Component Dr. Gazi M. A. Jalil, Professor, Dept of Agril. Economics, SAU

Project implementation

Annual activities of the projects designed for 2011-12 fiscal year were implemented for all the 09 listed projects. The first year activities of the 05 revenue projects and the last one of the SPGR, NATP projects were implemented in this year. The second year activities of the first one of the SPGR, NATP projects and the third year activities of the remaining two SPGR, NATP projects were also implemented in this period.

Policy level contribution

As expert member of the national team and member of the working group the scientists of the Division contributed to a number of policy level documents namely-National Agriculture Extension Policy, Fish Products (Inspection and Quality Control) Ordinance (Amendment), during the period.

Governing body member of SAARC Agriculture Center

The Member Director (Fisheries) is a member of the Governing Body (GB) of the SAARC Agriculture Center (SAC). As the GB member, he has been participating in different planning and decision making activities of the SAC.

Technical committee member of BFRI

The Member Director (Fisheries) is a member of the Technical Committee, the highest authority of the Institute for approval of the research activities to be implemented under revenue and development fund. The meeting of the technical committee was held at BARC conference room. The research projects for the year 2011-2012 were discussed in the meeting. Among others, the senior Officials of the Ministry of Fisheries and Livestock, Planning Commission, IMED, Professors from Universities, senior scientists of the institute were participated in the meeting.

Member of executive committee of Bangladesh Fisheries Research Forum (BFRF)

BFRF, as an independent organization of fisheries professionals including scientists, researchers, policy makers, private entrepreneurs, extension officials of universities, government and non-government

organizations working for fisheries research and development since 2004. The scientist of the Division, as Joint Secretary of the executive committee, voluntarily contributed through identifying and scrutinizing the researchable issues, field and desk monitoring of the activities. In delivering the activities, scientists regularly maintaining liaison with the organization and participated in the technical, as well as executive committee meetings of BFRF.

Technical committee member of SPGR (NATP)

The technical committee of SPGR plays an important role in approval process of SPGR Sub-projects. The Member Director (Fisheries) as an active member of the committee recommended different research sub-projects to be undertaken under the project.

Research and Financial Management and Coordination

The Division also played active role in coordinating among the institutes conducting fisheries research and finalizing the selection of annual research projects. Coordination among other NARS institutes, Universities and major extension agency, the Department of Fisheries through planning and participating in various activities related to fisheries research, development and extensions were intensified manifolds during the period. The Division regularly participated in the planning process of research projects of the BARC, BFRI, SPGR, NATP and KGF. A number of research projects were placed and discussed in various forums and finally approved for implementation during the period. One coordinated project, having a BARC component together with BFRI and Sher-e-Bangla Agricultural University (SAU) components is also being planned and implemented. The Division also assisted and guided the activities of Bangladesh Fisheries Research Forum (BFRF) and World Fish Center in the planning process of their research activities.

Monitoring, reviewing and evaluation report of programs/activities of NARS institutes

Review, monitoring and evaluation of the ongoing research activities of BFRI are regularly carried out during the period. In addition, intensive field visit was carried out jointly with Officials and Scientist of DoF/BFRI in various locations of the country and monitored the progress of activities implemented under core research projects as well as projects funded under the SPGR, NATP Phase I those listed above. Almost all the projects were implemented and managed according to the set agenda and achieved notable results.

Major achievements of Research of Bangladesh Fisheries Research Institute

Genetically upgraded rohu (*Labeo rohita*) and silver barb (*Barbodes gonionotus*) are performed higher

($p < 0.05$) growth achievement at 16% and 36% compared to local existing stocks. Improved germplasm of these carps were distributed in satellite stations of BFRI, DoF and selected hatcheries. Similarly, upgraded GIFT showed 35.38% higher growth than that of the founder stock and about 1.5 million fry of GIFT was produced in BFRI hatchery for distribution in satellite stations of BFRI, DoF and selected hatcheries. On the other hand, brood stock replacement techniques protocol was applied to produce F-3 generation of Thai koi (*Anabas testudineus*), showed 12% higher growth over founder stock. In line with conservation of endangered endemic fish species, scientist succeeded in induced breeding of chital (*Notopterus chitala*). In addition, natural breeding cuchia (*Monopterus cuchia*) has been achieved in pond condition. The mean GSI of female was minimum (2.78) in the month of December and January whereas the maximum was (5.00) in the spawning stage of maturation with one pick in April to June. Growth of native *M. cuchia* was observed better than exotic *M. albus*. Approaches to optimizing feeding regime and dietary protein in Thai koi and evaluation of selected probiotics in the formulated feeds for koi was tested. Development of aquaponic system as a new aquaculture techniques in Bangladesh was initiated to maximize fish production with vegetables.

Comparative percentage of spent hilsa (33.69%) observed in the spawning areas which were found 67% higher than based on the year 2003 (0.5%) indicating successful breeding of hilsa in the spawning grounds. No change of spawning grounds, indicating positive impact of 11 days fishing ban following HMAP (Hilsa Management Action Plan) suggested by BFRI. Under a bio-monitoring programme of 3 rivers (Padma, Meghna, Dakatia) 10 physical and 9 chemical parameters were studied. The values showed seasonal fluctuation and the deviations from the expectable range indicating the gradual fading of the freshness of rivers. The presence of toxic ammonia and lower amount of dissolve oxygen in some spots gives the glimpse of river pollution. On the other hand, 12 types of fish net, 2 types of fish trap and 2 types of hook line are identified with their characteristics under diversity of adaptive fishing gears and their impact on riverine fisheries programme. Catch composition of different types of fishing gear has been analyzed.

An attempt was made to breed two brackishwater fish species i.e. gold spot mullet (*Liza parsia*) and spotted scat (*Scatophagus argus*) in captivity through hormone induction with PG, HCG and ovaprim at different doses and different salinity levels. A study was conducted in the cemented cisterns to evaluate the efficiency of commercial prawn feed for the fattening of mud crab (*Scylla serrata*). After 20 days of feeding, it was found that 100% crabs got fattened with trash fish, which is generally used by the fatteners, followed by 80% fattening with Saudi-Bangla prawn feed and 90%

fattening with Quality prawn feed. In an another experiment, for the production of shrimp (*Penaeus monodon*) in modified extensive system (stocking density ($5/m^2$), after 70 days of rearing, growth of shrimp was 15.2-16.8g in ponds with 1-2% shrimp biomass, 17.5-18.2g in ponds with 2-3% shrimp biomass, 15.5-16.0g in ponds with 1-2% shrimp biomass + fertilization and 12.2-13.8g in ponds with 2-3% shrimp biomass + fertilization were obtained.

In south-western region, the rice farmers used 3 Organophosphate pesticides which including 5 trade name. They also used 3 Organocarbamate which including 10 trade name and 3 Pyrethroid of 12 trade name of locally available pesticide. The respondent farmers used mostly category Ia, Ib, and II pesticides that the WHO classifies, respectively extremely, highly and moderately hazardous. Almost all of the Carbamate pesticides the used are of extremely or highly hazardous category having wide spectrum toxicity to the environment. The pyrethroids they used were moderately hazardous. Fortunately no organochlorine pesticide has been found to be used by the respondent's farmers. A research programme has been running to determine the level of pesticides deposition and naturally occurring antibiotic metabolites in shrimp in Khulna and Bagerhat region. Research investigation on recent catastrophe in *golda* hatcheries of southern region identified MCD (Larval Mid Cycle Disease) by *Enterobacter aerogenes* and WTD (White Tail Disease) by *Macrobrachium nodavirus* pathogens.

Marine research on seasonal abundance of sharks revealed that shark harvesting gains momentum in October-December period and peaks during January-March, while catch gradually falls after that (April-June) with lowest catches during July-September. Moreover, dog shark was the dominant one while hammerhead and milk sharks followed it among the sharks. Whale shark, bull shark and saw-shark are caught in bigger sizes. Percentage of size abundance revealed that sharks are mostly caught at small sizes (>30 cm) while skates and rays were caught at bigger (>50 cm) sizes. With the aim to produce and storage quality dried fish product, it was found that, texture was firm and flexible and odor was very natural in case of silver pomfret or *rup chanda sutki* for 4 months and 3 months of ribbon fish or *churi sutki* in glass jar, thick polythene and in plastic containers. Dry fish color started change from light brown to brown after 5 months in case of silver pomfret and bright silver to grey after 4 months in case ribbon fish. No insect infestation was found during the experiment period.

BFRI has already fine-tuned its major technology packages on the basis of regional need and agro-ecological suitability. The institute has been continuously involved in extension of newly evolved suitable technologies in collaboration with Department of Fisheries and other GOs/NGO partners.

Transferable technology

BARC, under its research grants and SPGR-NATP funding supported 9 research projects as listed above. Most of the research projects are ongoing and were initiated before 1-3 years ago and continued over the reporting period. During this period the project activities generated various information, but any technology has not been released.

Research highlights of some of the important research projects are described below.

Study of reproductive endocrinology of mud eel *Monopterus albus* for artificial propagation

- Understanding different aspects of reproductive biology of *M. albus* studying GSI and gonadal maturity stages
- Identifying the location of GnRH and GtH genes in the brain and pituitary by immunohistochemistry
- Trial advanced maturation and spawning using specific GnRH-analog (GnRH-a)

Implementing Agency & Division/Section

Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh.

Implementation Locations: Laboratory of Aquatic Conservation Biology, Department of Fisheries Management & Fisheries Field Laboratory Complex, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh.

Major Activities

	Planned Activities	Implementation Status
1	Preparatory activities (Literature review, procurement, etc.)	Completed properly and timely
2	Brood collection, acclimatization in the captivity & brood rearing.	Completed properly and timely
3	Investigating different aspects of reproductive physiology	a. Seasonal gonadal cycles and germ cell stages of ovary and testes have been partly identified b. GSI partly estimated c. Fecundity of female <i>cuchia</i> estimated d. Secondary sexual characters identified
4	Breeding trials utilizing neuro-hormones (GnRH analogs)	Although induced breeding trials utilizing neuro-hormones (GnRH analogs) will be performed in the third year (2013-14) of the project, the first artificial propagation manipulating the environment was done in the very first year (March-2012).



Some activities of brood rearing of mud eel *Monopterus albus* for artificial propagation.

Production of genetically male tilapia by identification of YY supermales using microsatellite DNA markers

- To produce neofemale (genetically male but phenotypically female) by hormonal sex-reversal
- To produce putative YY super males by genetic manipulation and progeny testing
- To identify 'true' YY supermales from XY males using sex-linked microsatellite DNA markers in Nile tilapia
- To develop a stock of YY pure super males for mass scale genetically all male tilapia production

Implementing Agency & Division/Section

Department of Fisheries Biology and Genetics, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh.

Implementation Locations: The brood rearing, spawning and sex-reversal experiments are being conducted in a private tilapia hatchery (Agro-3, Fish Hatchery and Culture, Boilor, Trishal, Mymensingh). The DNA marker analysis and sex identification works are being conducted in the Fish Genetics and Biotechnology laboratory of the Fisheries Faculty, Bangladesh Agricultural University, Mymensingh.

Major Activities

	Planned Activities	Implementation Status
1	Collection and review of literature	Completed
2	Pond preparation and renovation	Completed
3	Collection and rearing of fish samples	Completed
4	Spawning and sex reversal by hormone treatment (Fig. 3).	On-going



Some hormone treated offspring of tilapia for the production of YY supermales.

Development of breeding and fry rearing techniques of endangered Tengra, *Mystus vittatus* and Gulsha, *Mystus cavasius*

- To develop a captive brood stock from different wild sources;
- To develop breeding protocol using different inducing agents and their dose optimization; and
- To establish fry rearing techniques.

Implementing Agency & Division/Section

Department of Fisheries Biology and Genetics, Bangladesh Agricultural University, Mymensingh.

Implementation Locations: Fisheries Faculty Field Laboratory Complex and Wet Laboratory, Bangladesh Agricultural University, Mymensingh-2202.

Major Activities

	Planned Activities	Implementation Status
1	Review and literature collection	Completed
2	Pond repairing	Completed
3	Collection of live fish sample	Going on
4	Stocking and rearing in the ponds (Fig. 4)	Going on
5	GSI, Fecundity and gonadal maturity Observation	Going on
6	Artificial breeding and dose optimization	Partly completed
7	Data analysis and report preparation	Partly completed



Some activities of brood development and fry rearing of Tengra, *Mystus vittatus*.

Study on fish disease and health management in rural aquaculture

- To assess the level of farmer's knowledge on fish health and disease and find out existing fish health management problems in rural aquaculture
- To identify and characterize pathogens involved in fish disease
- To develop fish health management protocol and provide training to farmers

Implementing Agency & Division/Section

Department of Farm Power and Machinery, Bangladesh Agricultural University, Mymensingh.

Implementation Locations: Department of Aquaculture, BAU, Mymensingh and Rural fish farms at Pabna, Bogra and Mymensingh.

Major Activities

Sl. no.	Planned Activities (2011-2012)	Implementation Status
01	Secondary data collection and literature review, laboratory set up	Completed
02	Questionnaire development, Pre-testing of questionnaire	Completed
03	Data collection through questionnaire interview and PRA activities, laboratory studies	Completed



Some disease infected fish samples collected from farmer's farm to investigated the disease.

Gene banking of improved brood stocks of Indian Major Carps (catla, rohu and mrigal) and development of breeding technique of three threatened species (mohashol, bagair and baim)

- Identification of genetically superior fish stocks of the species
- Selective breeding of the identified superior stocks
- Comparison of growth performances between seeds obtained by selective breeding and from hatcheries
- Cryopreservation of sperm of superior/improved stocks

Implementing Agency & Division/Section

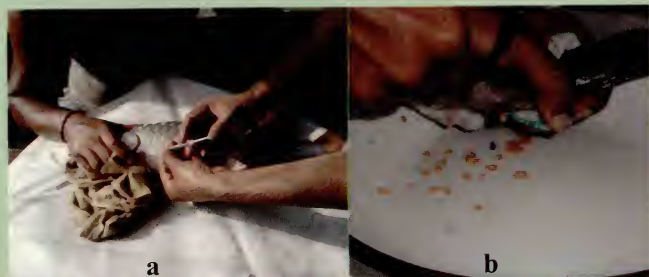
Department of Fisheries Biology and Genetics, Bangladesh Agricultural University, Mymensingh.

Implementation Locations: Fisheries Faculty Field Laboratory Complex and Wet Laboratory, Bangladesh Agricultural University, Mymensingh-2202.

Major Activities

	Planned Activities	Implementation Status
1	Genetic characterization of 3 IMCs through allozyme electrophoresis	Completed
2	Development of cryopreservation protocol of IMCs spermatozoa	Cryopreservation protocol of rohu and mrigal spermatozoa developed
3	Selective breeding of superior stocks of IMCs	Selective breeding of rohu and mrigal completed

	Planned Activities	Implementation Status
4	Collection, domestication and breeding of threatened species.	Collection and domestication of threatened species (mohashol, bagair and baim) done properly
5	Study of gonadal maturity through histological observation	Breeding seasons of mohashol and baim identified through histological observation



Some activities of artificial breeding activities of Mohashol (a) and Baim (b).

Coordinated Sub-project on addressing climate change on fisheries sector through community based technology identification and adoption in the fragile aqua ecosystems of Bangladesh: BARC Component

- Identify climate change related major vulnerable issues of fishers' and small aquaculture communities,
- Strengthen local community coping capacity through developing community based aquaculture/fisheries technology management plan,
- Pilot the identified technology options within the targeted communities.
- Develop guidelines for fisheries/ aquaculture management framework in context to climate change adaptation in similar communities

Implementing Agency & Division/Section

Bangladesh Agricultural Research Council

Implementation Locations: This project is working in two upazila, namely, Amtali of Barguna district and Kalapara of Patuakhali district in the Southern coast of Bangladesh.

Major Activities

Trials on five technologies are on going. These are-

	Planned Activities	Implementation Status
1	Cage aquaculture	Going on
2	Tilapia hapa breeding	Going on
3	Chital poly-culture	Going on
4	Sea bass poly-culture	Going on
5	Crab fattening	Going on



Some activities of cage culture (a) and crab fattening (b) under the project.

Project title

Coordinated sub-project on addressing climate change on fisheries sector through community based technology identification and adoption in the fragile aqua ecosystems of Bangladesh: Sher-e-Bangla Agricultural University (SAU) Component.

Implementing Agency & Division/ Section

Department of Agricultural Economics, Sher-e-Bangla Agricultural University, Dhaka.

Implementation locations: This project is working in two upazila, namely, Dimla of Nilphamari district and Gangachara of Rangpur district in the Northwest part of Bangladesh.

Sl. #	Planned activities	Implementation status
1	Conduct socio-economic baseline survey, Climate Vulnerability and Capacity Assessment (CVCA) and development of Upazila level management plans	Completed
2	Setting trials on-	
2.1	Cage aquaculture	On going
2.2	Mono-culture of koi & shingi in seasonal ponds	On going
2.3	Hapa breeding and nursing of tilapia	On going
2.4	Fish sanctuary management	On going
2.5	Community based fisheries management	On going



Training on cage aquaculture, Dimla (a), and tilapia fingerlings in Hapa, Gangachara (b).

National and international linkages

The efforts continued in maintaining working linkages with various research and development agencies,

stakeholders of national and international capacities. Some of the agencies are DoF, BRDB, IRDB, NARS institutes, universities, World Fish Center, BFRF, DFID etc. The established linkage with the aforesaid agencies was strengthened through collaborative activities during the period. The scientists of the division were regularly participated in the technical meeting and assisted in selection of their research proposals and prioritizing the activities. As member technical committee and expert members of monitoring team, the scientists contributing many agencies involved in fisheries development and extension. Involvements with the Department of fisheries were maintained in various ways. During the period the scientist as a member of different technical committees participated in meetings, workshops and contributed.

Collaboration and the working areas of the Division increased than the previous periods. Coordination and linkages with National and International agencies further strengthened. For effective management, monitoring and evaluation of the research activities, the Division needs more manpower for timely completion of assigned duties and responsibilities.

NATURAL RESOURCES MANAGEMENT

Forestry

Review of forestry research Programme

Research programme of Bangladesh Forest Research Institute and other organizations involved in forestry and agroforestry research and development have been reviewed and necessary guidelines have been provided. It was observed that BFRI took about 83 research programmes BFRI was suggested to undertake research programme in future to cater to the needs of the end-users. Similarly, agroforestry activities of BFRI, IFESCU, Khulna University, BAU, SAU, BSMRAU, BARI, BJRI and other organizations were reviewed and a national programme was developed.

BFRI was also suggested to take research Programme through bottom up approach. They were asked to organize Research Programme Review Workshop with the stakeholders and involving the related organizations at Regional level. Research Programme should be initiated at the regional level like other Research organizations. The research programme should be discussed also in the Central Review Workshop and finally approved in the Task-force meeting.

National Seminar on Fruit Tree Plantation Programme 2012

Organized a national seminar on Fruit tree Plantation Programme on 16 June, 2012 at BARC auditorium, Farmgate, Dhaka. Honorable Minister Mr. Anamul Haque Mostafa Shahid, MP. Ministry of Social Welfare

was present as Chief Guest and Mr. Monjur Hossain, Secretary, Ministry of Agriculture presided over the seminar. Dr. Abdur Rahim, Prof. Dept. of Horticulture, BAU, Mymensingh was the keynote speaker. The programme was undertaken as a part of national plantation programme.

Training Programme on Forestry Technologies

A two days Training programme on Forestry Technologies for professionals was organized during 13 – 14 May 2012 at BARC. The objectives of the training programme were to disseminate forestry technologies to the end users and to popularize the forestry technologies with in the Stakeholders. Seventy participants of 30 organizations participated in the training programme. Dr. Wais Kabir, Executive Chairman, BARC was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session as Chairperson.

NAWG meeting to discuss the problem & prospect of agroforestry:

Organized NAWG meeting to develop Agroforestry System in Bangladesh on 15 March 2012 and discussed the problems & prospects of Agroforestry.

Coordinated World Food Day Seminar:

Coordinated World Food Day Seminar was held on 16 October 2011 at BARC auditorium, Farmgate, Dhaka. The Seminar was presided by Secretary, Ministry of Agriculture CQK Mustak Ahmed, and Honorable Minister for Agriculture Begum Motia Chowdhury, MP was the Chief Guest. The theme of seminar was “Food Prices-From Crisis to Stability”.

Act as Focal Point of BSTI, WARPO and Department of Environment:

Participated in the meeting as the focal point of BARC at different organization like BSTI, WARPO, Department of Environment & Department of Forest.

Participated in the Advisory Committee Meeting & Expert Committee Meeting of BFRI:

Participated in the Advisory Committee Meeting and in the Expert Committee Meeting of Research Programme of Bangladesh Forest Research Institute, Chittagong.

Participation:

A number of workshop, seminars conferences, symposia and technical meetings were held during the reporting periods. Contributions were made in the form of paper presentation, as reporter of technical sessions and report presentations, facilitator in the working group; interactions were made as the active participants. Some important programme, attended are listed below:

Sl. No.	Organization/ Venue	Year	Duration		Name of Programme
			Mos.	Days	
1.	BSTI	2012	June	27	9 th meeting of Agriculture & food Department
2.	Chiang Mai University	2012	June	28	Agricultural Research Management

Participation and working as a member of different Technical Committee as follows:

- As a member of National Disaster Management Advisory Committee.
- As a member of Technical Committee of BSTI.
- As a member of Technical Committee of MOEF.
- As a Focal point of WARPO.
- As a Focal point of SLMP of MOEF.

Field Visits, Review, Monitoring and Evaluation:

Review, monitoring and evaluation of on going research activities of Bangladesh Forest Research Institute are regularly carried out by the Forestry Wing, BARC. Intensive field visit was carried out jointly with official and Scientist of DAE/NARS and NGOs in various locations of the country for technology selection, monitoring & evaluation. Forestry and agroforestry activities at Khulna University, Chittagong University, BFRI Chittagong, Satkhira, Khulna, Narshingdi, Gazipur, Dinajpur, and Rangpur district to Monitor the Coordinated sub project on "Improvement of Agroforestry Practices for Better Livelihood and Environment-BARC Component" and "Enrichment and conservation of Mangrove Ecosystem" SPGR subproject of NATP established at sundarban was monitored. Also BARI, Khulna was visited and monitored.

Agricultural Engineering

Policy Level Contribution

Advising the Govt. for appropriate steps on emerging problems and prospective issues in the field of Agricultural Engineering and other related fields. Some of the activities are given below:

- Elements of the Draft Statute Establishing the Proposed OIC Agro Industry Association".
- "Zero Draft Statute Establishing the Proposed OIC Agro Industry Association".
- "Bangladesh Water Act 2010"
- "Canal Digging Program for Irrigation"
- "Integrated Minor Irrigation Rules"
- Prepared scientific paper and its presentation to Secretary, MOA on "World Water Day 2012"
- Nomination letter MD (NRM) to UNAPCAEM as Governing council member of

8. "Master Plan of Haor Area"

9. "Strategies and Constraints of Irrigation Bangladesh"

All comments are submitted to the MOA as per their request through EC, BARC.

Maintained strong Linkage with the engineering professional bodies in home and abroad like CIMMYT, IRRI, IEB, UNAPCAEM, WARPO, BSTI, NGOs, and Universities etc.

Worked as Member in the Following committees:

- Draft minor irrigation rules preparation formed by MOA.
- An examiner for the M.Sc.Engg. thesis of Malay Krishna Madhu (Roll No 1009282004F,) of IWMF, BUET, Dhaka.
- Recruitment committee, BSRI and BLRI
- Technical committee, " Feasibility Study and Detailed Engineering for Ganges Barrage Project", BWDB, Dhaka
- PEC member," Bangladesh Rivers Information Conservation Program ---Off take management of the Gorai River Project", BWDB
- Reviewer on a project report by CDMP
- Attended various meeting at BSTI
- Attended meetings/ workshops organized by FAO, Bangladesh office.
- Convener/ member secretary/ member of various committees PIU-BARC NATP, KGF, BARC (Project Evaluation, Receiving Committee)

The unit has the responsibility of research management in the three distinct areas under agricultural Engineering, namely, Irrigation and Water Management, Agricultural Machinery and Mechanization and Post Harvest Processing Engineering. The unit oversees the major program being undertaken by the NARS institutes for the purpose of further improvement.

Highlights of R&D of the NARS Institutes

1.1 Farm Machinery and Postharvest Engineering

The research projects have been undertaken under the following, sub-programmes:

Design and Development of a Coffee Roaster:

Roasting of coffee beans is a thermal process. The aroma and flavor of coffee are developed during roasting. A power operated horizontal drum type coffee roaster was developed in Farm Machinery and Postharvest Process Engineering (FMPE) Division of Bangladesh Agricultural Research Institute (BARI) during 2011-2012. The roaster was made of locally available materials. An LP gas fired burner was used as the heat source and an electric motor of 0.18 kW was used to rotate the drum. By using a reducer gearbox,

rotating speed of the drum was maintained at 30 rev/min. The roasting temperature was controlled by the gas control valve. Any degree (light, medium or full) of roasted coffee could easily be obtained to meet the consumer requirement. The roaster was tested in FMPE Division, BARI, Gazipur, and Hill Agricultural Research Station, Khagrachari. The average capacity of the roaster was 4.5 kg/h. After roasting the green bean moisture content (11.83%) was reached to 7.96%, 3.08%, 2.92%, and 8.49% for light, medium, full and fry pan roasted bean, respectively. The color parameters were also evaluated for different roasted beans. It was found that fry pan roasted beans were showed very poor result for different color parameters compared with beans roasted in the roaster. The local and urban consumers were satisfied with the flavor and taste of the roasted coffee. The roaster should be tested and demonstrated at the farm level for its refinement and publicity.

Design and Development of a Manual Potato Slicer:

Promotion of small scale potato processing industries at home and cottage level at rural areas beside industrial level would be a substantial opportunity to reduce huge loss. Efficient and safe potato slicer is not readily available for this level of processing. Therefore, a manual potato slicer was designed and developed in Farm Machinery and Postharvest Process Engineering (FMPE) Division of Bangladesh Agricultural Research Institute (BARI) in 2011-12. Overall dimension of the slicer was 750×310×350 mm. The slicing efficiency, throughput and non-uniform slices of the potato slicer were found to be 82.72%, 15.75 kg/h, and 17.28%, respectively. Weight of the slicer was 11.5 kg. The adjustable chute of the potato slicer will be made to eliminate wobbling for different tuber diameter in the next year.

Design and Development of a Turmeric Polisher:

Dried turmeric is polished to remove the outer dirty skin, roots, and soil particles and transformed them into relatively smooth, bright and yellowish rhizomes. In farm level turmeric polishing is carried out manually by conventional methods which are slow, tedious and labour-intensive. To overcome these problems a turmeric polisher was designed and fabricated in Farm Machinery and Postharvest Process Engineering (FMPE) Division of Bangladesh Agricultural Research Institute (BARI) during 2011-12. Length, width and height of the polisher were 1040, 850 and 1450mm, respectively. Weight of the turmeric polisher was 90 kg. A 0.37 kW single phase electric motor was used as the source of power. The polisher was tested in FMPE Division and Hill Agricultural Research Station, Khagrachari. The polisher took 25 minutes to polish a batch of 30 kg turmeric. The drum of the polisher was rotated below the design critical speed of 30 rpm to avoid centrifuging. The experiment will be continued in the next year to improve the polishing performance and economic analysis.

Design and Development of a Power Groundnut Sheller:

Shelling of groundnut pod is laborious, time consuming and cost involving operation. Traditionally groundnut pods are shelled manually in Bangladesh. A power groundnut sheller was designed and fabricated in Farm Machinery and Postharvest Process Engineering (FMPE) Division, Bangladesh Agricultural Research Institute (BARI), Gazipur during 2011-12. The sheller was made of MS angle bar, MS flat bar, MS rod, MS sheet, MS wire, rubber pad etc. The shelling capacities of power groundnut sheller were 110 and 114.72 kg/h for Dhaka-1 and BARI badam 8 respectively. The maximum breakage of groundnut was found 2% at 11.5% moisture content (wb). The maximum and minimum unshelled percentage in power sheller was found to be 12.4% for Dhaka-1 and 9.18% for BARI Badam-8, respectively. The shelling efficiency of the power groundnut sheller for Dhaka-1 and BARI Badam 8 were 86.6 and 88.82%, respectively at 11.5% moisture content (wb). Winnowing efficiency was found to be 100% in the power groundnut sheller. This experiment will be continuing next year to improve the shelling percentage and to facilitate separation of unshelled groundnut from the output.

Modification and Improvement of Power Tiller Operated Bed Planter for Up Land Crop:

A power tiller operated bed planter has been improved with locally available materials in Wheat Research Centre, BARI and adaptive trials were conducted in the farmers' field of Dinajpur and Rajshahi area 2011-12. A Saifeng type bed planter also developed first time at BARI Rajshahi. Earlier only Dongfeng type bed planter was available. The bed planter formed a trapezoidal shape raised bed and can perform seeding and fertilizing operations on the top of the bed simultaneously in one operation. The bed planter is to be attached behind the power tiller (these are readily available in Bangladesh with reports of up to 4,50,000 within the country). The seeding quality of the planter has been improved with the introduction of inclined plate seed meter for seeding wheat, maize, rice, pulses and other small seeds. The bed planter also further improved with introduction of fertilizer box and roller type bed former. The implement comprises of four major components, namely- rotary tilling part, furrow opener, seeding unit with metering mechanism and bed shaper. This configuration is suitable for seeding on permanent bed also. Performance of the implement was tested for wheat, maize, mungbean and rice cultivation. The uniformity of maize seed spacing was 84.8-88.6%. The density of rice and wheat residue were 1.8 t/ha and 1.6t/ha in the tested plot, respectively when seeding on permanent bed. After initially forming the bed, an additional advantage was that reshaped bed can be used for next crop without any further tillage operation keeping it permanent. Fresh bed saved 21.5% and permanent bed saved 34.1% irrigation

water over conventional flood method of irrigation with less number of labour involvements. Water logging problem can be avoided introducing bed planting system, especially in rainy season crops. Bed planting allows earthing up, so no need sub sequent earthing up in maize cultivation. Maize planting cost in new bed and permanent bed was 63.0% and 72.5% less than conventional seeding method. Average wheat yield was 5.1 t/ha and conventional method broadcasting method was 3.6t/ha, respectively. There are about 4975 ha lands under bed planting system.

Effect of Postharvest Period and Hot Water Treatment on Shelf-Life And Decay of Mango: The *langra* variety of mango was harvested from a mango orchard of Chapai Nawabganj. They were treated at 55° C for 5 minutes in postharvest period of 6, 12, 24, 36, and 48 hours after harvesting. No significant effects of postharvest period and hot water treatment on weight loss were observed. In respect of shelf-life, postharvest period of mangoes exhibited significant effect. Decay of treated mangoes increased with the increase of postharvest period but they were lower than that of control (un-treated mangoes). In respect of firmness, postharvest period of mangoes exhibited identical. Eleven days after harvesting, the treated mangoes were more firm than that of control. The TSS (total soluble solids) of treated mangoes increased with the increased of postharvest periods. Postharvest periods of mangoes showed identical in respect of brightness. More brightness in treated mangoes was observed. Postharvest period of mangoes exhibited significant variation in respect of hue angle. The surface colour of treated mangoes was more attractive over the control. Hot water treatment of mango (*Langra*) should be carried out in postharvest period from 6 to 36 hour. This experiment will be continued to the next year.

Development of Suitable Package for Transportation of Guava: The study on fresh guava was carried out in Farm Machinery and Post-harvest Process Engineering (FMPE) Division, BARI, Gazipur in 2012. The fruits were packed in different packaging materials viz. bamboo basket, corrugated fibre board, wooden box, and plastic crate. Matured guava was harvested, sorted and packed in different packages from Banaripara, Barisal and transported to BARI, Gazipur by a pickup van. Then the guava packages were opened in FMPE Division, BARI, Gazipur and stored at ambient temperature ($28.8 \pm 2^\circ\text{C}$) and humidity ($87 \pm 2\%$) for 7 days. The effect of packaging materials on firmness and ascorbic acid in the fruits were studied. Firmness and ascorbic acid decreased with the increase of storage period. The highest shelf-life of guava was found in in wooden box without wrapping and lowest shelf-life was found in corrugated fibre board with polyethylene having 2% perforation. Wooden box was found suitable packaging materials for transportation

of guava in terms of freshness, shelflife and packing cost. This experiment will be continued to the next year.

Determination of Optimum Temperature for Drying of Mungbean Seeds: Thin layer drying experiments were carried out in a laboratory dryer for drying of mungbean seeds (BARI mung 6) at the temperature of 40, 42, 44, 46 and 48°C to find out the optimum drying air temperature in terms of drying time and seed quality. The seeds quality was measured in terms of germination, viability and vigor. Required times for drying at 38, 40, 42, 44, 46 and 48° C were 21, 17, 15, 12, 11 and 10 hours, respectively. At the drying air temperature of 40 to 42°C, seed germination, viability and vigour were about 93%, 90% and above 1.1, respectively. The optimum drying air temperature for drying of mungbean was found to be 42° C. Therefore, mungbean seeds should not be dried above the temperature of 42°C to get good quality seed.

Design and Development of Manual Carrier: Baseline survey was conducted to assess the need of manual carrier. According to the farmer's opinion manual carrier was designed. Also a test program on existing trolley was conducted to design prototype of manual carrier. There were three types of prototype of manual carrier had been designed on the basis of the test result and data analysis. Three prototypes were- i) prototype of trolley for two speeds, ii) prototype of trolley for 8-speeds change gear and iii) prototype of trolley for paddy-field. Even with 40 shaft instead current 29, an angle of misalignment of the bearing was exceeding. Therefore, two bearings must be used for one wheel or enlarge the diameter of the shaft. Bearing #6305 for outside support of the wheel and #6006 for inner support were selected. 6 bolts of M8x1.25 for sprocket to boss were used to design.

Development of Seedling Raising Technique for Mechanical Rice Transplanter: The seedlings were raised on polythene sheet and cut into slices of 28×58 cm size to feed into the seedling trays of the transplanter. Soils were amended with different combination of cowdung, rice husk, sawdust. A total of 14 (fourteen) treatments combining with different seed covering materials and dry and sprouted seed were used for this experiment. The cow dung mixed soil and without cowdung mixed soil were also used as treatment for this experiment. Sprouted seed were uniformly spread on the 14 (fourteen) treatments. The highest no. of seedling per square centimeter was found for T_9 (4.25) treatment (sprouted + soil + soil) followed by T_{13} (frame+ sprouted + soil) and T_7 (sprouted + soil + rice husk) treatments respectively. The lowest no. of seedling was found for T_{14} (frame + dry seed+ soil + rice husk) (2.24) treatments followed by T_{10} (sprouted + (soil + cowdung) + rice husk) and T_1 (dry seed + soil+ rice husk) respectively. Treatment T_9 (sprouted +soil +soil) seedling is more suitable for machine transplanting.

Walking type mechanical rice transplanter was tested in different farmer's field during T.Aman / 2011 season to evaluate the field performance. During field test, flexible plastic tray (58 x 28 x 2.5 cm) was used to raise seedling for the transplanter. 22-26 days older seedling with 3-4 leaves was used in this experiment. Yield performance of rice transplanting by mechanical rice transplanter were compared with hand transplanting method. In hand transplanting plot, farmer's seedling of the same variety BRRI dhan32 and BRRI dhan49 was used. Average yield of the machine transplanting plot and hand transplanting plot were 4.95 t/ha and 4.85 ton/ha. During evaluation, average speed (m/sec), field capacity (deci/hr), fuel required (l/hr), transplanting width (cm), no. of plants per hill, no. of hill per m², missing hill per m², floating hill per m², buried hill per m² and damaged hill per m² were found 0.8, 68.3, 0.88, 120, 3-6, 20, 1.8, 0.8, 0.5 and 1.1 respectively.

Walking type mechanical rice transplanter was tested in different project location during boro/2012 season to evaluate the field performance. During test, flexible plastic tray (58 x 28 x 2.5 cm) was used to raise seedling for the transplanter. Yield performance of rice transplanting by mechanical rice transplanter were compared with hand transplanting method. In hand transplanting plot, farmer's seedling of the same variety BRRI dhan28 and BRRI dhan29 was used. Average yield of the machine transplanting plot and hand transplanting plot were 6.42 t/ha and 6.28 t/ha. During evaluation, average speed (m/sec), field capacity (deci/hr), fuel required (l/hr), transplanting width (cm), no. of plants per hill, no. of hill per m², missing hill per m², floating hill per m², buried hill per m² and damaged hill per m² were found 0.82, 66.27, 0.92, 120, 3-5, 20, 1.36 0.73, 0.45 and 0.82 respectively.

Physical and Thermo-Chemical Properties of Rice Husk in Bangladesh: The physical and thermo-chemical properties of rice husks were characterize to be used as a feedstock for energy conversion process As a source of biomass fuel, the characteristics of four types different varieties of rice husk are determined in this study. The physical properties of different varieties of husks varied in terms of moisture and bulk density. The thermo-chemical properties of different types of rice husk also varied in terms of calorific value, proximate contents and elemental properties. Comparatively to Coal and rice husk residues had a lower calorific value. Whereas, other crop residues had higher ash content. Contents in nitrogen and sulfur were very low, so that potential environmental benefits of using agricultural residues as fuel.

Effect of Speed on Twist and Quality Ratio of Jute Yarn in Apron Draft Spinning Frame: Spindle speed is an important parameter for production of yarn. The spindle speed has various effects on productivity and

quality of yarn. It is directly related to the yarn tension during the winding of yarn on a bobbin. Spinning tension and spindle speed are two closely related parameters. It has been known from the earliest days of spinning that the spindle speed is increased, more yarn breakages occur.

Twist is an important criterion for a yarn of particular linear density (count). Appropriate twist is required for optimum strength. Insertion of more or less twist decreases the yarn strength. If a yarn is examined closely, it will be found that the number of turns of twist varies from point to point along the length. This arises mainly from the fact that the yarn mass itself fluctuates from point to point along the length.

The spindle speed and twist are to be optimized in this machine for achieving higher productivity and desired yarn quality. Optimization of speed will be done for 7.5 lb/spy jute yarns. The produced yarn will be used in producing hessian and finer fabrics for various diversified uses.

In this experiment yarns of 7.5 lbs/spy were produced at different spindle speeds of 2800, 3200, 3500, 3800 and 4200 rpm. Tensile strength, Quality ratio, extension at break of produced yarn at different spindle speed was determined. According to the experimental findings, spindle speed of 4200 rpm shows better quality of 7.5 lbs/spy jute yarn.

Investigation on the Physical Properties of Yarn Using Dissimilar Processing Parameters of Different Spinning Machines: Textile and jute sector is the backbone of Bangladesh economy. Bangladesh has been ranked fourth in global apparel exports and has grabbed a 3% market share according to recent world Trade Organization (WTO) report and has taken over 54.3% of the world trade in jute products. Bangladesh secured the fourth position in terms of value followed by China, EU-27 countries and Turkey.

There are currently has 341 spinning mills, 400 weaving mills, 310 dyeing mills, 210 dyeing and finishing mill, 8000 knitting and knit dyeing mills, 4800 garments factories, 20 jute mills (Govt.), 50 jute spinning mills (private). Jute and textile industry provides employment to 6.8 million people, contributes around 11% of the country's GDP, 42% of manufacturing value addition and 84% export earnings. Research activities in this field are demand of time. Important characteristics of jute fibre are its silky, luster, high tensile strength, low extensibility, and considerable heat and fire resistance. Because of its great abundance and shortage of cotton, jute is blended with synthetic fibre i.e. acrylic and jute acrylic blended yarns are manufactured mainly to take advantages of the higher strength of acrylic fibre. For the survival of jute industry, it is necessary to diversify the use of jute and develop new products with raw jute fibres.

The output of the proposed work would be the suitability of spinning machine and identification of optimum process parameters of the spinning machine for producing quality yarns. The findings will have a direct impact on the spinning industry and it certainly can be helpful to produce better quality yarns by adopting the method suggested. Consequently the quality of yarn will improve and uses of domestic yarn will be increased. Valuable foreign currency earning will be increased and sustainable by fulfill the yarn quality demands of customer.

1.2 Irrigation and Water Management

The research projects have been undertaken under the following, sub-programmes:

Water Requirement and Water Use Efficiency of Mustard Under Sprinkler Irrigation: This study was conducted in the experimental field of IWM Division, BARI, Gazipur to investigate the water requirement and water use efficiency of mustard using sprinkler irrigation. There were six irrigation treatments, each replicated thrice in a randomized complete block design (RCBD). Sprinkler irrigation method was used in treatment T_1 - T_5 and basin irrigation method was used in treatment T_6 . The results showed that plant height and yield were significantly influenced by different irrigation treatments. Other yield contributing characters such as no. of pods per plant, seeds per pod, branches per plant, plant population per m^2 and 1000 seeds weight varied with the irrigation but were not statistically significant. The highest seed yield (1.39 t/ha) was obtained from the treatment T_6 (irrigation at vegetative, pre-flowering and pod formation stages) and the second highest yield (1.38 t/ha) was obtained from the treatment T_4 (irrigation at vegetative and pod formation stages). The lowest seed yield (0.83 t/ha) was obtained from the treatment T_3 (irrigation only at pod formation stage). The vegetative stage was the critical stage to irrigation for mustard. The highest amount of seasonal water requirement (142.00 mm) was used in treatment T_6 while the lowest (96.00 mm) was used in treatment T_1 . The highest water use efficiency (13.3 kg /ha/mm) was found in treatment T_1 while the lowest (7.30 kg /ha/mm) was found in treatment T_3 . The benefit cost ratio (BCR) of sprinkler irrigation and basin irrigation method was 1.44 and 2.13, respectively. The results suggest that sprinkler irrigation method may not be economically feasible for mustard cultivation.

Effect of Water Stress on the Yield of Groundnut: An experiment was conducted in the research field of Irrigation and Water Management Division, BARI, Gazipur during the rabi seasons of 2010-2011 and 2011-2012 to determine an appropriate irrigation schedule for optimum yield and to find out the critical stage to irrigation for groundnut. There were five irrigations

treatments; each replicated thrice in a randomized complete block design (RCBD). The results showed that in the first year, plant height, number of branches per plant, seeds per plant, pods per plant, 100 pods weight and yield were varied significantly among the different treatments. But in the second year, plant height and 1000 seeds weight were significantly varied. Other yield contributing parameters were statistically non-significant in both the years. In the first year, the highest yield (2.10 t/ha) and the lowest yield (1.30 t/ha) were obtained in the treatments T_1 (no water stress) and T_5 (water stress at flowering and pod formation stages), respectively. Whereas, in the second year, the highest (1.65 t/ha) and lowest (1.34 t/ha) yields were obtained in the treatments T_5 and T_3 , respectively. Flowering and pod formation stage were the critical stages in the first year but in the second year, flowering stage was the critical stage. The highest and lowest seasonal water (329 mm and 209 mm) including an effective rainfall of 164 mm were used in the treatments T_1 and T_5 , respectively for the first year whereas in the second year, these values were obtained 204 mm and 124 mm in the same treatments including an effective rainfall of 68 mm, respectively. The highest benefit cost ratio (1.55) was found in treatment T_5 while the lowest (1.04) was obtained from treatment T_1 in the second year. This trend also prevailed in the first year.

Yield and Water Productivity Indices of Onion Under Sprinkler Irrigation: The water – yield relationship has been developed for onion grown under sprinkler irrigation to quantify crop water productivity functions (CWPF) for optimum use of irrigation water. The effect of different irrigation scenarios on growth, bulb yield and water use pattern of onion was also investigated with a field experiment conducted in the experimental field of IWM Division, BARI, Gazipur during December to March of 2011 – 2012. Seven different scenarios of irrigation were: T_1 = Surface irrigation where crop was irrigated at 15 days interval; T_2 = Sprinkler irrigation at 60% of ET_c ; T_3 = Sprinkler irrigation at 80% of ET_c ; T_4 = Sprinkler irrigation at 100% of ET_c ; T_5 = Sprinkler irrigation at 120% of ET_c ; T_6 = Sprinkler irrigation at 140% of ET_c and T_7 = Sprinkler irrigation at 160% of ET_c . Marginal water use efficiency (MWUE) and elasticity of water productivity (EWP) were calculated using the relationship between bulb yield and seasonal evapotranspiration (SET). A continuous increasing trend in growth parameters and yield was recorded with the increase in SET up to 140% ET_c . However, with further increase in SET the same was decreased. Though SET requirement for maximum yield (21.7 t/ha) was 249 mm but the highest (9.22 kg m^{-3}) water use efficiency (WUE) was attained with relatively low SET (202 mm). In terms of bulb yield, WUE and economics sprinkler irrigation found superior over the surface (conventional) one and sprinkler

irrigation with 120% ET_c found most suitable for bulb yield. This study confirmed that critical levels of SET needed to obtain maximum bulb yield or WUE, could be obtained more precisely from the knowledge of MWUE and EWP.

Cultivation of Maize Using Regulated Deficit Irrigation:

The study was undertaken to determine the water productivity of maize (BARI Hybrid Maize- 5) under deficit irrigation practice and to identify crop growth stages during which the crop can withstand water stress with limited effect on yield. The results showed that variation in timing and amount of irrigation had a reasonable impact on grain yield. The stem-elongation stage was found as the most sensitive to water stress. On the other hand, water deficit during the early and maturity stage had a limited effect on yield. Imposing water deficit at the heading stage (treatment T₃) resulted to the highest yield reduction. Water productivity was observed the lowest (1.83 kg/ m³) for the same treatment and the highest (2.74 kg/m³) for the treatment T₂ (stress at the stem elongation stage). The highest yield (8.68 t/ha) was obtained from the treatment T₂ which was irrigated thrice except the stem elongation stage. On the other hand, a slightly low yield (8.48 t/ha) was obtained from the no stress treatment T₁. This result implies that omitting irrigation or a slight stress at the stem elongation stage is not very harmful in respect of grain yield.

Potentialities of Using Surface and Ground Water for Upland Crops Cultivation in Saline Area: In the coastal saline belt area, cropping intensity is much lower compared to other areas of the country. Million hectares of land remain fallow during the Rabi and Kharif-I seasons after the harvest of T. aman, due to excess soil salinity and lack of adequate fresh irrigation water. The project aims to find the potentialities of using surface water and ground water for increasing yield, through the introduction of semi-salt tolerant different crops during fallow period (November to June). To achieve successful crop production and increase cropping intensity in the saline areas, four on-farm experiments with low water demanding and semi-salt tolerant crops (viz. sunflower, maize, soybean and mungbean) were set at farmers' field located Kharibila village, Satkhira Sadar, Satkhira. Experimental results revealed immense possibility of growing sunflower, maize and soybean crops in the saline area under the prevailing soil and water condition. Surface water and groundwater were found potential for growing sunflower, maize and soybean crop cultivation. These crops may be grown in order to bring saline land under cultivation which will increase food production, ensure food security and strengthen farm economy.

Studies on Irrigation Schedules of Rice and Non-Rice Crops for optimum Yield and Water Use: The objectives of this experiment were to make the effective

use of profile soil moisture for the cultivation of Rabi crops with minimum supplemental irrigation, effective utilization of water resources (surface water, rainfall and ground water), determine critical stages, time and amount of irrigation need for optimum yield and increased water use efficiency and identify and recommend most profitable cropping pattern for the area. Alalpur (North), Alalpur (South) and Rahmatpur of Mymensingh Sadar Upazilla, Mymensingh and Ramnagar, Rautola and Sachani of Magura Sadar Upazilla, Magura were selected for different on farm experiments of this project. Three cropping patterns i.e., T.aman – Fallow – Boro, T.aman – Mustard – Boro and T.aman-Wheat-T. aus for Mymensingh district and T.aman – Lentil – Sesame, T.aman – Mustard – Mungbean and T.aman-Chickpea-Jute for Magura district were followed. For all the cropping patterns, T. aman rice (popular varieties) was transplanted on July. All cultural practices were followed and data were collected and recorded, and analyses were done as per need. After T. aman harvest, Rabi crops were sown and harvested in due time. At the harvest time, necessary yield and meteorological data were collected and analyzed. After harvest of Rabi crops, boro rice was transplanted and Kharif-I crops were sown. Necessary data were collected at the harvest time and data were analyzed.

Studies on Optimum Water Requirement of Salt Tolerant Rice Variety Binadhan-8 : The experiment was conducted at farmers' field of Kharibila village, Satkhira Sadar, Satkhira during January-May, 2012 to determine the optimum water requirement and water productivity of salt tolerant rice variety Binadhan-8 in saline area. Experimental results revealed that Binadhan-8 creates an opportunity to increase rice production and in the saline area. This experiment will be repeated in the next year to confirm the findings.

Optimizing Water Use for Higher Crop Water Productivity Under Various Soil Moisture Regimes and Mulching Practices in the Existing Cropping Sequence: The objective of this experiment was to determine the response of different dry land crops to varying levels of soil moisture regimes and mulching practices during Kharif-II, Rabi and Kharif-I season. The experiment was conducted at Rajbari farm, Dinajpur. There were two cropping patterns eg; pattern I; T.aman (Binadhan-7)-Mustard (BARI sharisha 14) - Boro (BRRI dhan 28) and pattern II; T. Aman (BRRI dhan 49)-Potato (Cardinal)- Sesame (Binatil-1) using mulching practices in potato. For all the cropping patterns, T. aman rice (popular varieties) was transplanted on July. After T. aman harvest, Rabi crops were sown and harvested in due time. At the harvest time, necessary yield and meteorological data were collected and analyzed. After harvest of Rabi crops, boro rice was transplanted and Kharif-I crops were sown. All

cultural practices were followed and data were collected and recorded, and analyses were done as per need. The yield and yield attributing characters of rice in pattern-I was almost identical and produced a yield of 5.46 to 5.66 t ha⁻¹ under rainfed condition. Profile soil moisture pattern at different depth of irrigation treatments of BARIsarisha 14 showed that at sowing time the soil moisture at different depths (0-15, 15-30, 30-45 and 45-60 cm) was high ranging from about 30 to 40% (by volume) and harvest time it declined to 15 to 22 % (by volume). Irrigation practices had significant effect on the yield and yield attributing characters of BARIsarisha. The highest seed yield (1.99 t ha⁻¹) was obtained in irrigation treatment T₂. In cropping Pattern-II; Yield and yield attributing characters of rice (BRRI dhan 49) was almost identical (4.55 to 4.91 t ha⁻¹) under rainfed condition. Profile soil moisture distribution at sowing time to harvest time of potato at various depths of soil showed that at sowing time soil moisture was high (about 30 to 40% by volume). Periodical moisture in control plots showed a very gradual decreasing trend during its growing period.

Development of Soil Moisture Declination Model for Alternate Wetting and Drying Irrigation in Rice Cultivation:

Experiment was set up in BRRI farm, Gazipur, in boro season 2011-12 with the objectives to study the soil moisture dynamics for AWD irrigation, to develop a model for prediction of soil moisture dynamics, to predict the time of irrigation using the model and to validate the model. The treatments were T₁= Continuous standing water (1-5 cm) in levee without protection, T₂= Continuous standing water (1-5 cm) in levee with protection, T₃= AWD irrigation (up to 15 cm below ground level) in levee without protection, T₄= AWD irrigation (up to 15 cm below ground level) in levee in levee with protection, T₅= AWD irrigation (up to 30 cm below ground level) in levee without protection and T₆= AWD irrigation (up to 30 cm below ground level) in levee in levee with protection. Comparison of evapotranspiration, seepage & percolation, effective rainfall, irrigation requirement and irrigation applied data indicated existence of a continuous horizontal inflow of water in the plots from adjacent field. Therefore, soil moisture declination study is not possible in this plot and the experiment will be established in other plots in the next year. However, among the different AWD treatments, highest yield was obtained from 15 cm AWD plots followed by continuous standing water plots and 30 cm AWD plots. Irrespective of treatments, higher yield was obtained from non-protected plots compared to the protected plots.

Assessment of Performance of Low Cost Water Distribution Pipes for Minor Irrigation: Experiment was set up in BRRI farm, Gazipur, in boro season 2011-12 with the objectives to study the conveyance loss and

fuel consumption for plastic pipe, polyethylene pipe and earthen canal water distribution systems, to study the cost effectiveness of the distribution systems considering fuel consumption and to find out optimum engine speed for fuel efficient irrigation in different systems. Five types of distribution systems were used to compare the performance i.e., earthen canal, polyethylene pipe (5 inch diameter), polyethylene pipe (4 inch diameter), plastic pipe (3 inch diameter) and cotton pipe (3 inch diameter). It was observed that irrespective of distribution systems the fuel consumption and pump discharge increased with increase in engine speed. Specific discharge (discharge per unit of fuel consumption) data showed that less amount of water obtained for unit fuel consumption for both the higher and lower engine speed. The optimum engine speed gives highest volume of water for unit fuel consumption. Highest specific discharge (94.68 m³ per lit of fuel) was obtained from pump delivery at engine speed of 1570 RPM. The optimum engine speed for polyethylene pipe (5 inch diameter) is 1547 RPM and the corresponding specific discharge is 91 m³ lit per lit of fuel. The optimum engine speed for polyethylene pipe (4 inch diameter) is 1540 RPM and the corresponding specific discharge is 86.85 m³ lit per lit of fuel. The optimum engine speed for plastic pipe (3 inch diameter) is 1525 RPM and the corresponding specific discharge is 85 m³ lit per lit of fuel. The optimum engine speed for cotton pipe (3 inch diameter) is 1520 RPM and the corresponding specific discharge is 83.25 m³ lit per lit of fuel. All the distribution systems consume more fuel compared to earthen canal at a specific engine speed range. But the conveyance loss in all the systems is very much lower compared to the earthen canal. For 60 m (200 ft) section the distribution loss was found around 30 percent. For the same length of other distribution systems (polyethylene pipe, plastic pipe and cotton pipe) the conveyance loss is less than 5 percent. Considering specific discharge an engine speed within 1500-1600 RPM is optimum for earthen canal. For polyethylene pipe with 5 and 4 inch diameter 1450 to 1550 RPM is the optimum. For polyethylene and cotton pipe 1400-1500 RPM is the optimum.

Terminal Drought Mitigation Through Integrated Approaches in T. Aman Cultivation:

The experiment was set-up in Randomized Complete Block Design (RCBD) at Baradi farm, IETC, Bangladesh Water Development Board, Kushtia during Aman season 2010 to determine the effect of drought for different transplanting dates and to determine the yield for different transplanting dates. Two approaches were followed to find out the mitigation approach i.e., water management (rainfed and supplemental irrigation) and date of planting. Four planting dates were tested: T₁ = Transplanting on 10 July, T₂ = Transplanting on 17 July, T₃ = Transplanting on 24 July and T₄ = Transplanting on

31 July. A long duration variety (BR11) and a short duration variety (BRRI dhan33) were tested during Aman season. The historical rainfall data were collected from the Department of Agricultural Extension, Kushtia. The drought amount (deficit water in soil) was calculated using drought model. A downward trend of rainfall indicates rainfall amount is decreasing year after year. More terminal drought may cause due to this changing climatic situation. In 2011, total annual rainfall was 1128 mm which is considerably less than average annual rainfall of this region (1478 mm). Almost in all months rainfalls were less than average values except April, June and August in the year 2011. The average rainfall amounts in the month of April, June and August are 45, 180 and 227 mm, respectively but in 2011, those were 68, 201 and 326 mm, respectively. The weekly rainfall distribution pattern from 1 July to 30 November showed that rainfall was not sufficient as normal weekly rainfall occurrence in most of the weeks of those months. Higher rainfall than average weekly rainfall occurred only in the third week of July, second and third week of August and third week of September. The rainfall occurrence situation is very alarming that crop is not getting rain water in time and is suffering from terminal drought. In most of the year rainfall ceased after 15 October. Crop was timely transplanted by using supplemental irrigation without waiting for rainfall under supplemental irrigation treatment (W_1), whereas in rainfed treatment (W_2), transplanting was delayed by waiting for sufficient rainfall for land preparation. W_1 was transplanted on 17 July when W_2 was transplanted on 31 July. Two supplemental irrigation (200 mm for land preparation) at vegetative stage, one supplemental irrigation (50 mm) at reproductive stage and no supplemental irrigation at ripening stage were applied to mitigate the water requirement in treatment W_1 . W_2 suffered from terminal drought due to late transplanting. About 1.33 t/ha less yield was obtained in rainfed condition than that of supplementary irrigated condition. The early transplanting of T. Aman through supplemental irrigation ensured that T. Aman effectively mitigated the terminal drought occurred at reproductive stage and at vegetative stage during T. Aman season 2011. Short duration BRRI dhan33 suffered comparatively less drought than long duration BR11. The early transplanting of T. Aman through supplemental irrigation ensured that T. Aman effectively mitigated the terminal drought occurred at reproductive stage and at vegetative stage during T. Aman season 2011. Both short and long duration Aman varieties suffered less drought and showed good yield performance if they are transplanted during 24 to 31 July. In T. Aman 2011, suitable dates of transplanting were between 24 July and 31 July for BRRI dhan33 and BR11.

Design, Installation and Test the Performance of a STW to Explore the Fresh Groundwater Resources for Increasing Crop Production in Coastal Region of Sonagazi Area: The experiment was conducted at Sonagazi to assess the potentiality for development of suitable groundwater; to test the performance and cost-effectiveness of tube well irrigation; and to monitor the long-term effect of groundwater extraction in coastal saline areas. It was found that a good water bearing aquifer exists at a depth from 155 m to 180 m (510 ft - 590 ft). The pump was discharging groundwater with salinity level ranged from 0.30 to 0.57 dS/m which was below the permissible maximum limit (<4 dS/m) (Fig. 15). BRRI dhan28, BRRI dhan47 and BRRI dhan55 were grown during Boro 2012. The yield of BRRI dhan28, BRRI dhan47 and BRRI dhan55 were 5.52 t/ha, 5.27 t/ha and 5.70 t/ha respectively (Table 24). All the varieties performed well in irrigated condition. The mono-crop area has been converted into a double crop area which is a good news for the coastal saline areas. The adjacent farmers have started installing tube wells for irrigating Boro rice. Performance of the tube well is satisfactory. The finding may be disseminated to other areas where similar condition exists. But long-term effects of groundwater extraction in coastal saline areas should be monitored.

Co-ordinated Project on Water Management for Enhancing Crop Production Under Changing Climate: Co-ordinated SPGR (NATP Phase 1) funded Sub-project (components : BARC, BARI, BRRI and BINA) aimed to develop a feasible methodology for improving irrigation performance through better water management and raising the efficiency of water use in the country. The field experiments were conducted on T. aman in the farmers' field during the Kharif season of 2011 (July –December) at 8 locations in Bangladesh. Based on supplemental irrigation options, five treatments were selected for the studies. A very popular variety Sharna (an imported T. aman variety) was selected as the test crop. Due to excessive rainfall and off season showers during the late Kharif months, no significant difference in respect of grain yield was observed among the irrigated treatments. The grain yield ranged from 5.0 t/ha to as high as 5.73 t/ha.

An extensive survey work was conducted at three study regions during October-November 2011 to know the existing farming system and adaptation techniques to climate change. Based on the survey results, a few location specific promising cropping patterns were selected in respect of the project aim. As per selected patterns, the project activities were conducted.

1.3 Postharvest Technology of Crops

The research projects have been undertaken under the following, sub-programmes:

Standardization of Processing Method for Sweetened Condensed Corn Milk: The experiment was undertaken to standardize the processing method for condensed milk from corn to enhance the diversified use of corn. After extracting the milk from milky stage corn, it was processed into condensed milk adding sugar, glucose syrup, lactose, carboxymethyl cellulose (CMC) etc. and several trials were made to get the desired final product. The organoleptic quality attributes of the processed condensed corn milk were determined by a taste panel judges comprising 10 members.

They compared the quality attributes of the corn condensed milk made from a six combination of sugar and CMC percentage. The sweetened condensed corn milk prepared from the combination of 80% sugar and 0.3% CMC obtained the highest acceptability rank. After formulation the condensed corn milk was stored at ambient temperature and in refrigerator for a period of 8 weeks. Minimum microbial count was recorded for the corn milk+85%Sugar+0.3%CMC combination followed by corn milk +80%Sugar+0.3%CMC. The retention of vitamin A (β - carotene) and vitamin C was found better for the corn milk prepared from the combination of 80% sugar and 0.3% CMC.

Standardization of Processing Method for Green Mango Juice: The experiment was undertaken to develop a suitable formulation for preparation of green mango juice. The fruit pulps were analyzed for its chemical composition. Different formulations of green mango juices were prepared by different proportions of pulp, carboxymethyl cellulose (CMC) and other essential ingredients. The organoleptic quality attributes of the prepared juice were determined by a taste panel judges comprising 10 members. They compared the quality attributes of the juice made from a six combination of sugar and CMC percentage. The green mango juice prepared from the combination of 20% green mango pulp and 0.3% CMC obtained the highest acceptability rank. After formulation the green mango juice was stored at ambient temperature and in refrigerator for a period of 12 months. Minimum microbial count was recorded for the green mango juice prepared from 25%pulp and 0.3%CMC combination followed by 25%Pulp and 0.2%CMC and 20%Pulp and 0.3%CMC combination .The retention of vitamin A (β -carotene) and vitamin C was found better for the green mango juice of 20%Pulp and 0.3%CMC combination after 8 months of storage

Assessment of Pesticides and Ripening Chemicals Used in Selected Fruits at Different Locations of Bangladesh: A survey was conducted in four districts namely Tangail, Bogra, Rajshahi and Chapai Nawabganj

to assess the present status of the usage of pesticides and ripening chemical in major fruit crops like mango, banana and pineapple. A total of 270 samples having 90 from each districts were selected randomly for the study. The maximum number of fruit growers was belonged to the age group of 21-40 and 34% of farmers accomplished their secondary education in the study areas. However, most of the farmers did not receive any training on fruit pest management although many of them were engaged with NATP programme. Among the selected fruits, pineapple gave the highest yield (40 t ha^{-1}) although the production cost of this fruit was lower compared to other fruits. But the highest gross margin was attained from mango (Tk. 3,60,000 ha^{-1}). Different types of insect-pest and diseases attacked fruit crops at different growth stages, which caused rigorous loss of yield in the study areas. Hence, almost all of the fruit growers except pineapple were used synthetic pesticides for protecting their crops from pests. Among the farmer, nobody was followed IPM approach in his pest management programme. Generally, farmers of the study areas were applied pesticides with much higher dosages and frequencies than the recommendation. Most of the banana and pineapple growers used PGR during fruit development, while the pineapple growers further applied ripening agents in fruit before 3-4 days of harvest for attractive and uniform colour development. Mango growers were not applied PGR or ripening agent in mango for force ripening, however; few traders (10-15%) were applied ethephon in premature fruits after harvest.

Effect of 1-Methylcyclopropene on Storage Life and Quality of Banana Fruit: The influence of aqueous 1-methylcyclopropene (1-MCP) on the ripening of harvested banana fruit was investigated. Banana fruits at mature green stage were fully immersed in aqueous 1-MCP at 100, 200, 400 and 600 $\mu\text{g L}^{-1}$ for 10 min, quickly dried and then stored at $20 \pm 2^\circ \text{C}$ and 85-90% RH for 30 days. 1-MCP treatment delayed peel colour change and fruit softening, and thus, extended green life. Banana ripening was delayed when exposed to 100-600 $\mu\text{g L}^{-1}$, however; higher concentrations of 1-MCP were usually more effective for longer periods. The changes in fruit firmness, TSS, ascorbic acid contents and surface colour of fruit treated at two higher levels of 1-MCP remained strongly suppressed and consequently extended at least 20 days extra storage life compared to control fruit. Thus, postharvest application of 1-MCP at 400 $\mu\text{g L}^{-1}$ can be a feasible alternative technology for long distance transport of green banana fruit for marketing without refrigeration.

Effect of 1-Methylcyclopropene on The Storage Life of Mango Cv. Langra: Effect of 1-methylcyclopropene (1-MCP) on the ripening of mango fruit, and its physiological effects on the peel and flesh of mango were investigated after the fruits were immersed in different concentrations of 1-MCP (25, 50, 100 and

150 μ g L^{-1}) solutions for 10 min and then stored at 20 \pm 2 °C. The application of 1-MCP decreased the incidence of decay with no disease symptom at 100 or 150 μ g L^{-1} until end of 9 days storage. 1-MCP treatment delayed peel colour change and fruit softening when exposed to 50-150 μ g L^{-1} , however; higher concentrations were more effective. The changes in fruit firmness, peel colour, TSS, ascorbic acid contents, β -carotene, pH and titratable acidity of fruit treated at 150 μ g L^{-1} of 1-MCP remained strongly suppressed and consequently extended at least 3 days of extra storage life compared to control or hot water treatment (HWT). Thus, postharvest application of 1-MCP at 150 μ g L^{-1} can be a feasible alternative technology for prolonging the storage life of mature green mango fruit without refrigeration.

Assessment of Pesticides and Ripening Chemicals Used in Selected Vegetables at Different Locations of Bangladesh: A survey was conducted in seven districts namely Gazipur, Bogra, Rajshahi, Jessore, Narshingdi, Comilla and Jamalpur to assess the present status of the usage of pesticides and ripening chemical in major vegetable crops (i.e. tomato, brinjal, country bean and bitter gourd). A total of 280 samples having 40 from each districts were selected randomly for the study. The maximum number of vegetable growers belonged to the age group of 21-40, which is about 50% and 41.07% of farmers accomplished their primary education in the study areas. However, most of the farmers did not receive any training on vegetable pest management although many of them were engaged with NATP programme. Among the selected vegetables, tomato gave the highest yield (27.74 t ha $^{-1}$). But the highest gross margin was attained from country bean Tk. 4, 06, 832 ha $^{-1}$ among the selected vegetables. Different types of insect-pest and diseases attacked the vegetable crops at different growth stages, which caused rigorous loss of yield in the study areas. Hence, almost all of the vegetable growers were used synthetic pesticides for protecting their crops from pests. The farmers did not follow IPM approach in their pest management programme. Generally, farmers of the study areas applied pesticides frequently with much higher dosages than the recommended rate. Most of the tomato growers used PGR during vegetative development for attractive and uniform colour development. However, few traders (10-15%) were applied ethephon in premature vegetables after harvest.

Effect of Packaging Techniques on Quality and Shelf Life of Mango (*Kirsapath*): The experiment was conducted to study the effect of packaging techniques on the quality and shelf life of mango (*kirsapath*). Uniform matured fresh mango was selected and washed with 200 ppm clorax water for preventing microbial infestation. Then mangoes were kept in five different perforated polypropylene packet (34micron) viz.0%, 0.25%, 0.5%,

0.75% and 1%. Non packet mango was used as control treatment. Mangoes were stored at ambient condition for observation. Physical appearance and physio-chemical parameters was observed and recorded. The obtained result showed that stored mango kept in 0.75% perforated packet at ambient condition was effective in prolonging the storage life up to 12days whereas the shelf life of control treatment was 7 days in respect to firmness (kg-force/cm 2), colour, freshness, (%) physiological weight loss,(%) decay/rotting loss, (%) TSS, (%) acidity, (mg/100g) vitamin C, (μ g/100g β -carotene as well as sensory evaluation.

Effect of Temperature and Relative Humidity on the Quality and Shelf Life of Pineapple: The experiment was conducted to study the effect of temperature and relative humidity on the quality and shelf life of pineapple. Uniform matured fresh pineapple was selected and washed with potable water. Then pineapples were kept in polypropylene (43micron) with 1% perforated packet and stored at five different temperatures viz.7, 9, 11, 13 and 15 °C with 88 \pm 2%RH. These treatments were compared with control treatment which was kept in ambient condition. Physical appearance) and physio-chemical parameters was observed and recorded. The obtained result showed that pineapple stored at 11°C temperature with 88 \pm 2%RH was effective in prolonging the storage life up to 21 days whereas the shelf life of control treatment was 7 days in respect to firmness (kg-force/cm 2), colour, freshness, (%) physiological weight loss,(%) decay/rotting loss, (%) TSS, (%) acidity, (mg/100g) vitamin C, (μ g/100g, (%) total sugar as well as sensory evaluation.

Effect of Ripening Chemicals on Postharvest Quality of Tomato: The study was conducted to assess the effect of different concentration of ripening chemicals on the postharvest quality of tomato(Udayan) and to optimum the doses of the ripening chemicals. Tomato treated with different concentration of ethephon solution (0ppm, 250ppm, 500ppm, 750ppm, 1000ppm and 10000ppm) on its ripening behaviour. Tomato treated with ripening chemical (ethephon) enhanced the ripening process within 3-4 days (breaker stage) and it turned to light red (60-90%) within 6-8 days. The non treated tomato did not uniform colour developed even after 12 days (turned to light red) (60-90%). Application of higher doses (6ml/lit) decreased the shelf life of tomato (6-8 days) and There is a little bit different of its physico-chemical parameters, i.e., TSS (%), acidity (%), pH, vitamin-C content (mg/100g), β -carotene content (μ g/100g), total sugars content(%) among the treatment. The estimated residue (ethephon) in treated tomatoes was decreased with the duration of storage (1.92-0.52ppm) and it was below the existing Codex residue level (CXL) (2ppm).

Effect of Ripening Chemicals on Postharvest Quality of Banana: The study was conducted to evaluate the

effect of different concentration of ripening chemicals on postharvest quality of treated banana (sagar) and to standardize the optimum doses of the ripening chemicals for banana. Banana treated with different concentration of ethephon solution (0ppm, 250ppm, 500ppm, 750ppm, 1000ppm and 10000ppm) on its ripening behaviour. Banana treated with ripening chemical (ethephon) enhanced the ripening process within 3 days and it became full coloured within 5-6 days. Non treated banana was observed to produce light yellowish colour and texture became medium soft but ethephon treated banana was observed appropriate attractive uniform yellow colour development and texture became soft. The estimated residue (ethephon) in treated banana was observed below the existing codex recommended residue level during 7 days of storage both in treated banana pulp and banana peel. There is a little bit difference between of its physico-chemical parameters, i.e., TSS (%), acidity (%), vitamin-C content, -carotene content, sugars content among the treatment.

Study on the Physicochemical Characteristics and Amino Acid Profile of Different Varieties/Cultivars of Pulses in Bangladesh: Varietal performance for nutritional and functional properties was investigated in the Postharvest Technology Division of BARI. Investigations were made on the proximate analysis of two varieties of chick pea named BARI sola-5 and BARI sola-9. One advance line of pigeon pea was also analyzed which will be released very soon from BARI. Investigation revealed that the protein (20.33%) and fat (3.55%) content were comparatively higher in BARI sola-5. Higher amount of fat (4.98%) was observed in BARI sola-9. Both varieties had considerably increased the water absorption swelling properties with time. Advance line of pigeon pea had a considerable amount of protein (29.16%), fat (4.54%) and ash (3.95%). Both the pulses chick pea and pigeon pea expressed good hydration co-efficient and swelling coefficient.

Estimation of Physicochemical and Whole Amino Acid Profile and in Vitro Protein Digestibility of Newly Released Varieties of Wheat in Bangladesh: Six wheat varieties collected from Regional wheat research centre, Gazipur were subjected to physicochemical analysis to determine their nutritional status during 2011-2012. The quality parameters studied were protein, starch, ash, and fibre. BARI gom-25 had the maximum Protein (13.35%) in ITS condition. Variety Pradip had the highest starch (63.57%). Highest amount of fibre (2.64%) and NDF (16.54%) was determined in the varieties BARI gom-28. Ash was found maximum in the variety BARI gom-26.

Development of Protocol for Residue Analysis of Food Additives and Contaminants: This experiment was conducted to develop protocol for residue analysis of different pesticides used in fruits and vegetables. On

the basis of literature, different types of protocol for extraction and quantification were carried out in PHTD Laboratory on trial and error basis. To estimate five pesticides i.e., Chlorpyrifos, Giazinon, Malathion, Carbyl and Carbofuran has been developed.

Soils

Project Development and Implementation

Development and coordination of projects are the major responsibilities of BARC. The Soils Unit of BARC is working in line with the mandate of the Council. The Unit oversees the soil fertility and fertilizer management related programs in the country. During 2011-12 the Unit is involved in coordination of four coordinated Sponsored Public Goods Research (SPGR) Sub-Projects and implementation of one single component Sub-Project under the National Agriculture Technology Project (NATP) funded by the World Bank, IFAD, IDA and GoB. The Member-Director (NRM), BARC is working as the Coordinator and CSO and PSOs of the Unit are working as the Associate Coordinators of the Sub-Projects. Besides, the Unit also looks after the other soil fertility and fertilizer management related single component SPGR Sub-Projects of NATP implemented by different NARS institutes in the country. The SPGR Sub-Projects those are coordinated and implemented by Soils Unit of BARC are as follows:

Table 1. SPGR Sub-Projects coordinated and implemented by Soils Unit of BARC

Sl. No.	Sub-Project Title	Organization
Coordinated Sub-Project		
1.	Land Productivity and Its Enhancement through Utilization of Surface Water in Coastal Area of Bangladesh	BARC, BARI and SRDI
2.	Carbon Sequestration in Soils of Bangladesh	BARC, BRRI, BINA and BSMRAU
3.	Coordinated Project on Arsenic in Soil-Plant-Water System	BARC, BARI and SRDI
4.	Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns	BARC, BARI, BRRI, BINA, BJRI, BSRI, SRDI and BAU
Single Component Sub-Project		
5.	Updating of Fertilizer Recommendation through Interpretation of Research Results Generated by the NARS Institutes	BARC

Besides, another single component SPGR Sub-Project entitled "Development of Nitrogenous Bio-fertilizer for Sugarcane with Free-living and Associative Bacteria Using Biological Nitrogen Fixation (BNF) Technology" is being implemented at the Bangladesh Sugarcane Research Institute under the supervision of Soils Unit of BARC.

Policy Level Contribution

Activity of Fertilizer Technical Sub-Committee

Fertilizer Technical Sub-Committee was formed by the Ministry of Agriculture (MoA) in 1997 to help the National Fertilizer Standardization Committee. Member-Director (NRM), BARC works as the convener and Additional Director (Implementation), DAE as the Member Secretary of the committee. The committee comprises of 19 (nineteen) members with the CSO (Soils), BARC, CSOs of Soil Science Divisions of different NARS institutes, CSO, OFRD; representatives from different concerned organizations like Departments of Environment, Livestock, Fisheries, BSTI, SRDI, BADC, BCIC etc. A plant physiologist from BARI is also working as a committee member for giving technical support in evaluation of plant growth regulators (PGRs).

During 2011-2012, two meetings of Fertilizer Technical Sub-committee were held with Member-Director (NRM) in the chair. A number of organic and chemical fertilizers and PGRs were evaluated in these meetings, among which 1 (one) chemical fertilizer, 10 (ten) organic fertilizers and 2 (two) PGRs were recommended for standardization to the National Fertilizer Standardization Committee.

Comments on Fertilizer Demand, Production, Use and Related Issues

The Soils Unit is involved in monitoring the technical and environmental issues regarding fertilizer production, storage, marketing and use in the country and provides the necessary policy suggestions and information to the government, DAE, fertilizer producers, users and development agencies for the betterment of agricultural development and environmental protection. This year the Fertilizer Technical Sub-committee provided comments to the Ministry of Agriculture on the following aspects:

- i. Outcome document of the first round negotiation and third round negotiation meeting on the zero draft prepared for the Rio-20 conference.
- ii. Import of fertilizer for cultivation of orchid flower.
- iii. Seed Bangla Organic Fertilizer produced by Seed Bangla Agro-industry.
- iv. Impact of increasing the price of diesel and fertilizers.
- v. Import of new fertilizer as sample.
- vi. Ability of six organic fertilizer factories for commercial production of organic fertilizers.
- vii. Land degradation assessment and monitoring for sustainable management and climate change adoption in South Asia.
- viii. Fertilizer Requirement in the country.
- ix. Quality of imported DAP fertilizer.
- x. Selling of powder DAP fertilizer.
- xi. Import of NPK mixed fertilizer.

- xii. Establishment of organic fertilizer factory through use of EEF fund of Bangladesh Bank.

Research Management and Coordination

As the apex body of National Agricultural System (NARS) the major mandates of BARC are planning, coordination, monitoring and evaluation of research programs being carried out by different NARS institutes including agricultural universities. The Soils Unit of BARC regularly organizes the Annual Research Review and Planning Workshop of Soils Program of NARS Institutes. The research programs executed in the NARS institutes during the previous year and research programs for the next year are thoroughly reviewed and discussed in the workshop.

Besides, Soils Unit is also involved in the Research Review and Planning Workshops conducted at different NARS Institutes. The Member-Director (NRM), and CSO and PSOs of Soils Unit were invited as the expert members in the internal review workshop of Soil Science Division, BARI, BRRI and BSRI. They were also invited in the central review workshop of BARI and SRDI to discuss and review the soil, fertilizer and irrigation related research activities of 2011-12 and proposed research programs of 2012-2013. The Principal Scientific Officer (Soils), BARC attended the Annual Research Review and Planning Workshop, 2011 of BRRI and BSRI. The research programs of the institutes were critically reviewed in the workshop and necessary suggestions and guidelines were provided. The following research programs were recommended for a sustainable agricultural production system in the country in the area of soil fertility and fertilizer management.

- Integrated Plant Nutrition System (IPNS) following best management practices.
- Fertilizer management in mixed/multiple cropping.
- Promotion of bio-fertilizer in the cultivation of pulses and oilseed crops.
- Use of optimum doses of potash fertilizers in intensive cropping to check large K mining from soil reserve.
- Recycling of rice straw/crop residues to supplement potash fertilizer in intensive cropping.
- Minimizing yield gap through On-farm trials and demonstrations through efficient management of inorganic and organic fertilizers.
- Identifying secondary and micronutrient deficiencies and updating of critical limits.
- Use of poultry manure (PM) in upland crops and maintenance of soil fertility.
- Determination of tolerance limit of heavy metal contaminants in soils, fertilizers, water and plants.
- Development of rapid composting techniques for proper use of house hold wastes, municipal wastes etc.
- Organic recycling and waste management.

- Management of organic matter depleted soils.
- Management of problem soils and char lands.
- Management of erosive soils and conservation of soil moisture in hill agriculture.
- Management of coastal soils.
- Yield target oriented research and maximizing production.
- Maintenance of long-term soil fertility and soil health.
- Updating of Soil and Land Resources Utilization Guide (Upazilla Nirdeshika)
- Assessment of arsenic contamination in soil, water and plant.
- Identification of arsenic accumulation plant species.
- Assessment of fallow land and its proper use.

Coordinated Activities with SRDI: Upazilla Nirdeshika National Program

The national programme on “**Upazilla Land and Soil Resources Utilization Guide (Upazilla Nirdeshika)**” is being implemented since 1986 under the guidance, co-ordination and monitoring of BARC. “Upazilla Nirdeshika” is the outcome of the concerted efforts of the participating agencies, SRDI, DAE, BARI, BRRI and BINA. These guides provide location specific land-soil-crop-water resource database to prepare micro-level crop production and other area development plans through bottom-up planning process.

Printing of all 459 Upazilla Nirdeshika in the first phase of Nirdeshika Programme was completed during December 2002. For the second phase i.e. after December 2002, the program of updating Nirdeshika has been started. By this time 116 updated Nirdeshika have been published. Updating of another 26 Nirdeshika is almost at the final stage and awaiting printing.

Training of Trainers (TOT) and training of Sub-Assistant Agriculture Officer (SAAO) are most important part of the Upazilla Nirdeshika programme for implementation of the guide at the field level. A number of TOT program on Upazilla Nirdeshika have been conducted for Upazilla and district level officers of DAE. During 2010-11, CSO (Soils), BARC is worked as a resource person of the TOT.

Farmers’ Service through Mobile Soil Testing Laboratory (MSTL)

Since inception of the service to the farmers through Mobile Soil Testing Laboratory (MSTL) of SRDI from March 1997 under the National Soil Health Service Networking Program of MOA thousands of soil samples from the farmers’ field have been collected analyzed in the MSTL and soil test based fertilizer recommendation cards have been provided to the concerned farmers in different areas of the country. The Soils Unit of BARC

provided the policy planning and guidance for this coordinated activities.

The SRDI has 12 MSTLs, of which 10 are working in full swing covering 112 Upazilas. During 2011-12 a total of 6500 farmers’ soil samples have been analyzed. The soil samples were analyzed for pH, EC, P, K and S. Fertilizer recommendation was provided based on Fertilizer Recommendation Guide-2005 of BARC. There is a committee for smooth running of the MSTL program. The committee composed of the members from SRDI, BARC, BARI, BRRI, BINA, BJRI and DAE. Chief Scientific Officer (Soils), BARC is working as a member of the committee. The committee monitors the activity of the MSTL program. The committee also annually reviews the total activities of MSTL and approves the next year program for giving services to the farmers.

Monitoring and Evaluation

Soils Unit of BARC is actively involved in the regular monitoring and evaluation program of BARC. Scientists of Soils Unit worked as the team member of the Monitoring and Evaluation teams formed by the Planning and Evaluation Division of BARC. Member-Director (NRM) and Chief Scientific Officer (Soils), BARC worked as the Team Leaders of two monitoring groups formed for monitoring the SPGR Sub-Projects in 2011-12 and monitored the activities of the Sub-Projects assigned to their respective groups. Besides, two Principal Scientific Officers of the Unit also worked as the team members of the monitoring groups and actively took part in the monitoring activities. BARC sponsors contract research projects for generation and dissemination of technologies. The Soils unit has the responsibility to evaluate the Soil and Fertilizer Management related proposals. The research grants are allocated to both public and private sector organizations including universities and NGOs.

Highlights on Transferable Technologies of SPGR Sub-Projects

Surface water quality in the coastal saline area for safe irrigation: Water salinity of the coastal greater districts like Khulna, Jessore, Faridpur, Barisal, Patuakhali, Noakhali and Chittagong are being monitored with a view to identify safe water zone for irrigation. A total of 2537 water samples have been collected and analyzed from 128 sites during February to December, 2011. Kakshiali, Morichan and Shibsha rivers of Khulna district remain saline throughout the year. While other rivers of the district remain non-saline during July to December. In greater Jessore district, all the rivers remain non-saline throughout the year except Kapataxma, Bhoirob and Afra for the month of May. So, water of the rivers can be used safely for irrigation throughout the year. All the rivers of greater Faridpur district remain non-saline

throughout the year. Except Baleswar, Panguchi, Shahbazpur, Saplleza, Tuskhali and Illisha rivers all other rivers of greater Barisal district remain non-saline. Water from Shahbazpur river can be used as for irrigation during July to November. Water of Baleswar and Panguchi becomes saline from March. In greater Patuakhali district, all the rivers except Pakhimara, Baleswar, Andermanik, Payra, Rabnabad Galachipa and Bishkhali remain non-saline. Except Noakhali Khal, choto Feni river and chilonia river all other rivers in greater Noakhali district remain non-saline during July to December. In greater Chittagong district, all rivers except Sangu and Karnafuli remain non-saline. Sangu remains saline throughout the year. The information might be useful in using river water for irrigation.

Crop production on raised bed by using harvested rain water in coastal area: Crop performance on raised bed by using harvested rain water in the pond was studied in the Salinity Management and Research Center (SMRC), Soil Resource Development Institute (SRDI), Batiaghata, Khulna. Soils of both raised beds (45 cm height) and adjacent flat land remained non-saline ($<2\text{dS/m}$) during wet season but soil salinity of the flat land was found to increase from January to May at higher rate compared to that of the raised bed. Yield of vegetables like Sweet gourd and Indian Spinach was found 18 and 30 t/ha on raised bed and, 10 and 20 t/ha on flat land, respectively. Raised bed might be recommended for higher crop production in the coastal saline area of Khulna.

Performance of different vegetable crops in saline area of Khulna: Performance of four winter vegetables viz. cabbage, cauliflower, knol khol and red beet in saline area at the MLT site, Dumuria, Khulna during 2011-'12 of Khulna. The land was irrigated thrice from the nearest pond and salinity of irrigated water was recorded. The highest net return (Tk. 423980) and BCR (3.68) were obtained from cauliflower. The lowest net return (Tk. 133211) and BCR (2.02) were observed in knol khol. Cauliflower was found more profitable than knol khol in the coastal saline area of Khulna.

Intercropping of tomato with different short duration leafy vegetables: Three intercropping combinations viz. T_1 : Sole tomato (60 x 40 cm), T_2 : Tomato (60 x 40 cm) + 2 rows of red amaranth 20 cm apart between the tomato rows and T_3 : Tomato (60 x 40cm) +2 rows spinach 20 cm apart between the rows were studied at the MLT site, Dumuria during 2011-12. The intercrop red amaranth and spinach affected the growth of tomato adversely resulting poor growth and low yield of tomato. The highest fruit yield (58.30 t/ha) was recorded in sole tomato and the highest tomato equivalent yield (54.74 t/ha) was obtained from T_2 when red amaranth was intercropped with tomato. HYV tomato was found profitable in sole cropping system

than inter cropping with leafy vegetables in the coastal saline areas of Khulna.

Integrated nutrient management for tomato production: Four nutrient management treatments were studied viz. T_1 : Soil test based fertilizer dose for HYG as per Fertilizer Recommendation Guide-2005, T_2 : IPNS with 3t ha⁻¹ poultry manure for HYG, T_3 : IPNS with 5 t ha⁻¹ CD for HYG and T_4 : Farmers' practice was studied at the MLT site, Dumuria during 2011-12. The IPNS treatment with 3 t ha⁻¹ poultry manure (T_2) produced the highest fruit yield of tomato (93.33 t ha⁻¹) among the treatments studied, which might be recommended for the coastal saline areas of Khulna.

Screening of BARI released tomato varieties in coastal saline area: Ten tomato varieties viz. BARI tomato 2, BARI tomato 3, BARI tomato 8, BARI tomato 9, BARI tomato 14, BARI hybrid tomato 3, BARI hybrid tomato 4, BARI hybrid tomato 5, Surakkha and a local variety were studied at the MLT site, Dumuria, Khulna during 2011-12. Among the varieties BARI hybrid tomato 4 was found to produce the highest yield (61.25 t/ha), which might be recommended for the coastal saline areas of Khulna.

Effect of mulching on the yield of musk melon in costal area: Two mulch materials viz. rice straw and rice chita along with control (no mulch) were studied in the farmer's field at MLT site, Dacope during 2011-'12. The highest yield (41.33 t/ha) was recorded from the plot where rice straw was used as mulch, which might be recommended for the coastal saline areas of Khulna.

Performance of sesame varieties in coastal area of Khulna: Performance of three sesame varieties viz. BARI til 3, BARI til 4 and a local variety was studied in the farmer's field at the MLT site, Dacope, Khulna during 2011-'12. Among the varieties, BARI til 4 produced the highest seed yield (990.00 kg/ha), which might be recommended for the coastal saline areas of Khulna.

Effect of mulching and irrigation on the yield of okra: Eight treatment combinations viz. T_1 : No irrigation with mulch, T_2 : No irrigation without mulch, T_3 : Irrigation at vegetative stage with mulch, T_4 : Irrigation at vegetative stage without mulch, T_5 : Irrigation at vegetative + flower initiation stages with mulch, T_6 : Irrigation at vegetative + flower initiation stages without mulch, T_7 : Irrigation at vegetative + flower initiation + 20 days after flower initiation stages with mulch, T_8 : Irrigation at vegetative + flower initiation + 20 days after flower initiation stages without mulch were studied on Okra at the MLT site, Dacope, Khulna during Kharif-I season, 2011-'12. The highest yield (13.82) was recorded from the treatment, T_7 where irrigation was applied at vegetative + flowering + 20

days after flower initiation stages with mulch, which might be recommended for the coastal saline areas of Khulna.

Improvement of crop productivity through introduction of bitter gourd in Fallow-Fallow-T. Aman cropping pattern in coastal areas of Khulna: Performance of bitter gourd, introduced in Kharif-I season in the Fallow-Fallow-T. Aman cropping pattern was studied in the saline area of the MLT site, Dacope, Khulna during 2011-12. Bitter gourd was planted during the third week of March 2012 and harvested during the first week to fourth week of May 2012, which indicates sufficient turn around time for timely transplanting of the following T. Aman rice. The yield of bitter gourd was found 24.75 t/ha. Thus crop productivity in the saline area of Khulna could be increased by growing an extra bitter gourd crop in the existing cropping pattern Fallow-Fallow-T. Aman.

Growing mungbean in coastal saline area: Mungbean (BARI mung-6) was grown in the saline area of MLT site, Dumuria during 2011-12. The seeds were sown in the third week of February 2012 and the crop was harvested on third week to fifth week of April 2012. The yield of mungbean was found 1681 kg/ha. The gross margin was Tk. 68,481/ha and BCR was 2.11. Mungbean could be grown successfully in the coastal saline areas of Khulna.

Performance of different crops/varieties in different level of salinity in coastal area: Fourteen rabi crops were tested at different levels of salinity during Rabi season of 2011-2012 in the saline area at Killar Char, Gangchil under Companiganj Upazilla and Hazirhat under Sadar upazilla. BARI Sarisha 15 (Mustard) and BARI Tishi 1 (Linseed) produced 894 kg ha⁻¹ and 675 kg ha⁻¹ seed yield, respectively. Salinity level above or around 8.0 dS m⁻¹ was found harmful for crop growth and survival. Groundnut (BARI Chinabadam 8) and Mungbean (BARI Mung 6) were badly affected to higher salinity (10.12 -11.43 dS m⁻¹). Chilli, Batishak, Garlic, Wheat, Cowpea and sunflower could be grown successfully up to 7-8 dS m⁻¹ level of salinity.

Chilli - Garlic intercropping system in coastal saline area: Six intercropping treatments viz. T₁: Sole garlic (local), T₂: Chilli + local garlic, T₃: Chilli + BARI Rashun 1 (20%), T₄: Chilli + BARI Rashun 2 (20%), T₅: Chilli + BARI Rashun 1 (40%) and T₆: Chilli + BARI Rashun 2 (40%) were studied along with T₇: Sole chilli (local) were studied in the saline area at East Killarchar, Amanatganj, Thanarhat, Hazirhat and Dhormapur under Companiganj, Subornachar and Noakhali Sadar Upazillas of Noakhali during rabi season of 2011-2012. Chilli + 40 % BARI Rashun 2 produced highest Chilli equivalent yield (2.51 t ha⁻¹), LER (1.27), net return (Tk 261850/ha) and BCR (3.96). The results suggest that Chilli + 40 % BARI Rashun 2 might be recommended for coastal saline area of Noakhali.

Intercropping of garlic with watermelon in coastal saline area: Intercropping of garlic with watermelon was studied in the saline area of Subornachar Upazilla, Noakhali during rabi season, 2011-2012. The highest marketable fruit yield of watermelon was obtained 36.10 t/ha from Watermelon + BARI Rashun-2 treatment, whereas it was 34.32 t/ha in sole watermelon. Gross return (Tk. 339900/ha) and net return (Tk. 23200/ ha) were found highest in Watermelon + BARI Rashun-2 treatment. The results suggest that Watermelon + BARI Rashun-2 might be recommended for coastal saline area of Noakhali.

Performance of Mustard-T. aus-T. aman cropping pattern with replacement of varieties in coastal saline areas of Noakhali: The local variety of mustard in the existing cropping pattern Mustard-T. Aus-T. Aman was replaced by the modern variety, BARI Sarisa 15 and its performance was studied in the saline area of Killar Char, Companiganj and Hazirhat, Char Kazimoklech, Amanathganj and Banglabazar of Noakhali Sadar Upazilla during rabi season, 2011-12. The variety BARI Sarisha-15 produced the higher seed yield (1050 kg/ha and economic benefit compared to local variety (586 kg/ha). The results indicated that yield of mustard could be increased significantly in the saline areas of greater Noakhali by replacing the local variety with modern varieties.

Performance of Linseed-T. aus-T. aman cropping pattern with replacement of varieties in coastal saline areas of Noakhali: The local variety of Linseed in the existing cropping pattern Linseed-T. Aus-T. Aman was replaced by the modern variety, BARI Tishi 1 and its performance was studied in the saline area of Killar Char, Companiganj and Hazirhat, Char Kazimoklech, Amanathganj and Banglabazar of Noakhali Sadar Upazilla during rabi season, 2011-12. BARI Tishi 1 produced higher seed yield (1030 kg/ha) and BCR (2.60) over local variety (700 kg/ha and 1.88, respectively). The results indicated that yield of linseed could be increased significantly in the saline areas of greater Noakhali by replacing the local variety with modern varieties.

Performance of Mungbean-T. aus-T. aman cropping pattern with replacement of varieties in coastal saline areas of Noakhali: The local variety of Mungbean in the existing cropping pattern Linseed-T. Aus-T. Aman was replaced by the modern variety, BARI mung 6 and its performance was studied in the saline area of Killar Char, Companiganj and Hazirhat, Char Kazimoklech, Amanathganj and Banglabazar of Noakhali Sadar Upazilla during rabi season, 2011-12. BARI mung 6 produced higher seed yield (1012 kg/ha) and BCR (2.45) over local variety. The results indicated that yield of mungbean could be increased significantly in the saline areas of greater Noakhali by replacing the local variety with modern varieties.

Performance of Soybean-T. aus-T. aman cropping pattern with replacement of varieties in coastal saline areas of Noakhali: The local variety of Soybean in the existing cropping pattern Linseed-T. Aus-T. Aman was replaced by the modern variety, BARI Soybean 5 and its performance was studied in the saline area of Killar Char, Companiganj and Hazirhat, Char Kazimoklech, Amanathganj and Banglabazar of Noakhali Sadar Upazilla during rabi season, 2011-12. BARI Soybean 5 produced higher seed yield (2345 kg/ha) and BCR (1.84) over local variety (1717 kg/ha and 1.49, respectively). The results indicated that yield of soybean could be increased significantly in the saline areas of greater Noakhali by replacing the local variety with modern varieties.

Cowpea cultivation with improved technologies in saline area: Two production packages viz. farmers' practice and improved technology were tested for growing cowpea in the farmers' fields in the saline area of FSRD site, Hazirhat, Noakhali Sadar and Subornachar during rabi season of 2011-12. In improved practice proper spacing of 30 cm x 10 cm and optimum fertilizer dose ($N_{20}P_{60}K_{40}S_{20}Zn_5$ kg/h) were used. Improved technology produced higher seed yield (1265 kg/ha) and it was about 112 % higher over farmer's practice. Improved technology practice was found more profitable over farmer's practice due to higher net return (Tk. 46460/ha) and BCR (2.58). The production package might be used to produce cowpea in the saline area of Noakhali.

Mustard cultivation with high yielding varieties in saline area: BARI Sarisha-14 and BARI Sarisha-15 were tested against local variety in the coastal saline area of Killarchar, Companiganj; Char Kazi Mokhes, Subornachar and in Hazirhat, Noakhali Sadar Upazilla during rabi season of 2011-12. The highest seed yield was obtained from BARI Sarisha 14 (1037 kg/ha), which was significantly higher over the local variety (580 kg ha⁻¹). BARI Sarisha 14 produced gross margin of Tk. 2505/ha and benefit cost ratio of 2.15. The variety might be cultivated in the saline area for its higher yield and economic benefit.

Linseed cultivation with high yielding varieties in saline area: BARI Tishi 1 was tested against local variety in the coastal saline areas of Killarchar, Char Torabali, Karamatpur under FSRD site, Hazirhat, Noakhali during rabi season, 2011-12. Field duration of BARI Tishi 1 was 105 days, which was 10 days earlier than that of local variety (115 days.) Yield of BARI Tishi 1 ranged from 920 to 1275 kg/ha and that of local variety ranged from 465 to 745 kg/ha. BARI Tishi 1 also gave higher gross return (Tk. 55500/ha) and benefit cost ratio (2.80) compared to the local variety (Tk. 29400/ha and 1.57, respectively). The variety might be used in the saline area for its higher yield and economic benefit.

Sweet Potato cultivation with high yielding varieties in saline area: BARI Mistialu 8 and BARI Mistialu 9 were tested against local variety in the coastal saline areas of Killarchar, Char Torabali, Karamatpur under FSRD site, Hazirhat, Noakhali during rabi season, 2011-12. BARI Mistialu 8 produced the highest yield (22.41 t/ha), gross return (Tk.179280/ha) and benefit cost ratio (3.50). The variety might be used in the saline area for its higher yield and economic benefit.

Soybean cultivation with high yielding variety in saline area: BARI soybean-5 was tested against local variety in the coastal saline area of Hazirhat, Karamatpur, Char Clark, Banglabazar, under Noakhali Sadar and Subornachar Upazilla during rabi season, 2011-12. BARI soybean-5 produced the highest yield (2214 kg/ha), gross return (Tk. 84132/ha) and benefit cost ratio (1.69). The variety might be used in the saline area for its higher yield and economic benefit.

Scientists of Soils unit worked as the members of the following committee-

- Agriculture and Food Committee of BSTI
- Fertilizer and Allied Products Committee of BSTI
- Fertilizer Distribution Committee of BCIC
- Steering Committee for Establishment of Laboratory of SRDI
- Project Management Committee of Soil Resources Management and Strengthening Farmers Services Project.
- Evaluation of SPGR Sub-projects under Soils and Water management.
- কৃষি জমির উর্বরতা সংক্রান্ত কৌশল নির্ধারণ, বাস্তবায়ন ও পরিবীক্ষণসহ গুনগতমান সম্পন্ন সার ব্যবহার নিশ্চিতকরণের লক্ষ্যে গঠিত সাব-টেকনিক্যাল কমিটি।

As the members of these committee scientists of Soils Unit regularly attended the meetings and contributed with comments, opinions and suggestions.

Agricultural Economics and Rural Sociology

Research, Financial Management and Coordination

- i) "Potentialities of Major Fruits Farming and Marketing System and Price Behavior in Hill Region of Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.
- ii) "Assessment of Socio-Economic Impacts of Pulses Research and Development in Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.
- iii) "Assessment of Socio-economic Impacts on Oilseeds Research and Development in Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.
- iv) "Consequences of Tobacco Cultivation in

- Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.
- v) "Impact of Agricultural Cash and Kind Support System on the Rural Farm Economy of Bangladesh". Core Research.
 - vi) "Economic Impact of Climate Change on Crop Production in Southern Zone of Bangladesh". Core Research.
 - vii) "Study on Rural Households' Food Security in Coastal Region of Bangladesh". Core Research.
 - viii) "Hybrid rice technology and its sustainability at the farm level: A study on food security for farm households". Core Research.

Policy Level Contribution

Different policy oriented comments were sent to the Ministry of Agriculture according to their requirements. Some of those are as follows:

- (i) Comments of BARC on ODB Group Member Country Partnership Strategy (MCPS) and Country Economic Work (CEW) for Bangladesh Draft report.
- (ii) Comments of BARC on "Development Objective Grant Agreement between the United States of America and the People's Republic of Bangladesh for Implementation of the USAID Country Development Cooperation Strategy".
- (iii) Comments of BARC on "National Cooperative policy, 2012".
- (iv) Comments of BARC on "Agreement Between the People's Republic of Bangladesh and the International Fund for Agricultural Development on the Establishment of the IFAD's Country Office".
- (v) Comments of BARC on "Value Chain Management for Agricultural Products".
- (vi) Comments of BARC on "Documentary film on the impact of the EU Food Facility for rapid response of soaring food prices in developing countries".

- (vii) Comments of BARC on "Import Policy, 2012-2015".
- (viii) Comments of BARC on "Master Plan for Agricultural Development in Southern Region of Bangladesh".
- (ix) Comments of BARC on "Draft Economic Zones Regulations 2011".
- (x) Paper entitled "Women in Agriculture" prepared for the Global Conference on Women in Agriculture during 13-15 March 2012 at the NASC Complex. Pusa, New Delhi, India.
- (xi) Comments of BARC on "Population Policy 2011".
- (xii) Provide information regarding 'Background document' for Economic and Social Survey of Asia and the Pacific 2012.
- (xiii) Comments of BARC on "Textile Policy 2011".
- (xiv) Provide brief for the workshop "Enhancing Food Security in Bangladesh: Evidence for Action" organized by IFPRI.
- (xv) Comments of BARC on "National Plan of Action for Implementation the National Child Labour Elimination Policy 2010".
- (xvi) Comments of BARC on "Draft IOR ARC Preferential Trade Agreement".

Monitoring, reviewing and evaluation report of programs/activities of NARS Institutes

A three member monitoring team was formed to observe the progress of the SPGR Sub-Projects conducted by BAU. The team leader and member was Dr. S M Khalilur Rahman, Member Director (AERS), BARC, Dr. Md. Monirul Islam, Director (Nutrition), In-charge, BARC, Dr. S M Khorshed Alam, PSO (Crops), BARC and Dr. Md Jalilur Rahman, PSO (Fisheries), BARC respectively. This team monitored the progress of activities during 28-30 March 2012 of the following projects.

	Sub-Project Title	PI
1	Remote Controlled Gutti Urea Applicator	Professor Dr. A.T.M. Ziauddin
2	Collection of some targeted threatened plant species of Sylhet forests for sustainable management and curation	Professor Md. Mustafizur Rahman Dept. of Crop Botany, BAU, Mymensingh
3	Epidemiological Investigation of Anthrax and Determination of Efficacy of Local Anthrax Vaccine in Bangladesh	Dr. K.H. M. Nazmul Hussain Nazir. Assoc. Professor, Dept. of Microbiology and Hygiene, Faculty of Veterinary Science, BAU, Mymensingh
4	Study on Fish Disease and Health Management in Rural Aquaculture	Professor Dr. Md. Ali Reza Faruk Dept. of Fisheries Biology and Genetics, BAU, Mymensingh
5	Study of reproductive endocrinology of mud eel <i>Monopterus albus</i> for artificial propagation	Dr. Harunur Rashid, Dept. of Fisheries Biology and Genetics, BAU, Mymensingh
6	Production of genetically male tilapia by identification of YY supermales using microsatellite DNA markers	Professor Dr. Md. Samsul Alam, Dept. of Fisheries Biology and Genetics, BAU, Mymensingh
7	Development of breeding and fry rearing techniques of endangered Tengra, <i>Mystus vittatus</i> and Gulsha, <i>Mystus cavasius</i>	Professor Dr. Md. Mukhlesur Rahman Khan, Dept. of Fisheries Biology and Genetics, BAU, Mymensingh

Dr. Rahman also monitored the following projects.

	Sub-Project Title	PI	Date/Place
1	Enrichment and conservation of mangrove ecosystem	Dr. Md. Masudur Rahman, Divisional Officer, Bangladesh Forest Research Institute, Mujgunni, Khulna	7-9 February, 2012 Sundarban, Munshiganj, Satkhira
2	Marketing and Value Chain System of Brackish Water and Marine Fisheries Products and By-products in Bangladesh	Prof Dr. Md. Sirajul Islam, Dept. of Agricultural Economics, BAU, Mymensingh	25 February, 2012 BAU, Mymensingh
3	Development of Salt tolerant rice varieties through induced nutrition and marker assisted selection	Dr. Md. Mofazzal Hossain, PSO, BINA, Mymensingh	11-13 April, 2012 Dumuria, Khulna sadar, Bagerhat, Satkhira

A two member monitoring team was formed to observe the progress of the SPGR Sub-Projects conducted by different research institutes like BARI and BRRI. The team leader and member was Dr. A.S.M. Anwarul Huq,

CSO (AERS), BARC and Dr. Md. Monirul Islam, Director (Nutrition), In-charge, BARC respectively. This team monitored the progress of activities of the following projects.

	Sub-Project Title	PI
1	"Coordinated Project on contaminants and adulterants in food chain and their mitigation: BLRI Component"	Dr. Nathu Ram Sarker Senior Scientific Officer & Head, Animal Production Research Division, Bangladesh Livestock research Institute, Savar, Dhaka-1341, Bangladesh
2	Coordinated project on contaminants and adulterants in food chain and their mitigation: BARI component	Dr. Md. Miaruddin Principal Scientific Officer Postharvest Technology Division, BARI.
3	Assessment of Socio-Economic Impacts on Pulses Research and Development in Bangladesh	Dr. Md. Abdul Matin PSO, Agricultural Economics Division, BARI, Gazipur
4	Consequences of Tobacco Cultivation in Bangladesh	Dr. Tanvir Mahmud Bin Hossain SSO, Agricultural Economics Division, BARI, Gazipur
5.	Coordinated project on Contaminants and Adulterants in food chain and their mitigation: BRRI Component	Dr. Muhammad Ali Siddiquee Principal Scientific Officer & Head Grain quality and Nutrition Laboratory, BRRI, Gazipur-1701
6.	Coordinated project on contaminants and adulterants in food chain and their mitigation: BAU Component (347)	Dr. M. Burhan Uddin Professor, Department of Food Technology and Rural Industries (FT&RI), BAU, Mymensingh
7.	Coordinated project on contaminants and adulterants in food chain and their mitigation: BFRI Component	Dr. Md. Enamul Hoq Senior Scientific Officer Bangladesh Fisheries Research Institute, Mymensingh 2201
8.	Development of threshold level (seed health standard) of <i>Colletotrichum corchori</i> in jute seed	Ms. Hasina Banu Principal Scientific Officer Pest Management Division Bangladesh Jute Research Institute
9.	Production and development of the jute based blended fabrics in cotton processing system for textile uses	Dr. Md. Abul Kalam Azad CSO, Pilot Plant & Processing Division BJRI, Manik Mia Avenue, Dhaka-1207
10.	Coordinated project on contaminants and adulterants in food chain and their mitigation: BARC Component	Member Director (Fisheries) Bangladesh Agricultural Research Council, Farmgate, Dhaka -1215

A three member monitoring team was formed to observe the progress of the BARC Core Research Programme/Projects carried out during the period of 2011-12 conducted by BINA and BAU. The team leader and members was Dr. Md. Khalequzzaman A. Chowdhury, MD (Crops), BARC, . Dr. A.S.M. Anwarul

Huq, CSO (AERS), BARC and , and Dr. Md. Abdus Salam, PSO(P&E), BARC, respectively. The monitoring team monitored the implementation progress of five core research projects at BINA and BAU, Mymensingh during 02-04 May 2012. The following projects were monitored by the team.

	Sub-Project Title	PI
1	"Coordinated Project on contaminants and adulterants in food chain and their mitigation: BLRI Component"	Dr. Nathu Ram Sarker Senior Scientific Officer & Head, Animal Production Research Division, Bangladesh Livestock research Institute, Savar, Dhaka-1341, Bangladesh
2	Coordinated project on contaminants and adulterants in food chain and their mitigation: BARI component	Dr. Md. Miaruddin Principal Scientific Officer Postharvest Technology Division, BARI.
3	Assessment of Socio-Economic Impacts on Pulses Research and Development in Bangladesh	Dr. Md. Abdul Matin PSO, Agricultural Economics Division, BARI, Gazipur
4	Consequences of Tobacco Cultivation in Bangladesh	Dr. Tanvir Mahmud Bin Hossain SSO, Agricultural Economics Division, BARI, Gazipur
5.	Coordinated project on Contaminants and Adulterants in food chain and their mitigation: BRRI Component	Dr. Muhammad Ali Siddiquee Principal Scientific Officer & Head Grain quality and Nutrition Laboratory, BRRI, Gazipur-1701
6.	Coordinated project on contaminants and adulterants in food chain and their mitigation: BAU Component (347)	Dr. M. Burhan Uddin Professor, Department of Food Technology and Rural Industries (FT&RI), BAU, Mymensingh
7.	Coordinated project on contaminants and adulterants in food chain and their mitigation: BFRI Component	Dr. Md. Enamul Hoq Senior Scientific Officer Bangladesh Fisheries Research Institute, Mymensingh 2201
8.	Development of threshold level (seed health standard) of <i>Colletotrichum corchori</i> in jute seed	Ms. Hasina Banu Principal Scientific Officer Pest Management Division, Bangladesh Jute Research Institute
9.	Production and development of the jute based blended fabrics in cotton processing system for textile uses	Dr. Md. Abul Kalam Azad CSO, Pilot Plant & Processing Division BJRI, Manik Mia Avenue, Dhaka-1207
10.	Coordinated project on contaminants and adulterants in food chain and their mitigation: BARC Component	Member Director (Fisheries) Bangladesh Agricultural Research Council, Farmgate, Dhaka - 1215

During the period following comments have been prepared and sent to Ministry of Agriculture:

- Value Chain Management for Agricultural Products
- Documentary film on the impact of the EU Food Facility for rapid response of soaring food Price in developing countries
- FAO Sub-regional Workshop on Sex-disaggregated Data in Agriculture and Rural Development for South Asian Countries Report
- Draft TOR ARC Preferential Trade Agreement
- Smoking Law
- Crop Insurance
- Economic Review
- Khulna Agricultural university Law
- Productivity in Syllabus
- Child labour Law
- Enhancing Food Security in Bangladesh: Evidence for Action
- Draft Textile Policy
- Economic and Social Survey of Asia and the Pacific - 2012
- List of agricultural products for Nepal market
- Planning Consulting Cooperation Framework Agreement proposed by China Development Bank
- EC-Bangladesh Trade Joint Economic Cooperation sub-group on Trade and Economic Cooperation
- Southern Delta Agricultural Development Master Plan

- Import Law
- Population Law
- Global Conference on Women in Agriculture during, New Delhi, India.
- Inter-ministerial and Consultative Meeting on the Draft Bangladesh Economic Zones Regulations.
- Agreement Between the People's Republic of Bangladesh and International Fund for Agricultural Development on the Establishment of the IFAD's Country Office
- Country Profile
- Economic Review, 2012

Research Highlights of NARS Institutes

Agricultural Economics, BARI

Adoption and Profitability of BARI Winter Tomato Variety in Some Selected Areas of Bangladesh

- 19% farmers adopted BARI tomato variety and the rest 81% farmers adopted exotic tomato varieties.
- The cost of production of Raton and BARI hybrid tomato-5 were Tk 156337 and Tk 174266 per hectare.
- The yield of Raton and BARI hybrid tomato-5 were 35 metric tons and 42 metric tons per hectare
- The yield gap of both Raton and BARI hybrid tomato -5 were 56%.

- Net return of Raton and BARI hybrid tomato -5 were Tk 283696 and Tk 335734 per hectare
- The net return of Raton and BARI hybrid tomato-5 were higher than its competing crops potato, lentil and mustard.
- Human labour, land preparation, seedling, urea, TSP, MoP and irrigation had significant effect on BARI tomato cultivation.
- Non-availability of BARI tomato variety seed at proper time, lack of technical knowledge, lack of storage facilities and infestation of insects and diseases were the major constraints of BARI tomato cultivation.

Financial Profitability of Some BARI Mandated Crops

- BCR on full cost TC basis were found above 2 (two) in tuberos, brinjal, pointed gourd, cauliflower, tomato, sweet potato, ginger, turmeric, soybean, chilli and pineapple; within 1.5 to 2 in marigold, cabbage, watermelon, potato, maize, onion and garlic and less than 1.5 in bitter gourd, okra, panikachu, mustard, mungbean and groundnut.
- Net return (Tk/ha) on full cost TC basis were found above four lakh in tuberos and turmeric; above three lakh in brinjal and pointed gourd; above two lakh in tomato, ginger and pineapple, above one lakh in marigold, panikachu and potato; above half lakh in bitter gourd, cabbage, cauliflower, water melon, sweet potato, onion, garlic and chilli; above ten thousand in okra, maize, soybean and mustard, and above five thousand in mungbean and groundnut.
- Total cost (Tk/ha) on full cost TC basis were incurred two and half lakh for brinjal, pointed gourd, okra and panikachu; above two lakh for tuberos; above one and half lakh for potato and ginger; above one lakh for tomato, ginger, onion and pineapple; above half lakh for cabbage, cauliflower, watermelon, maize, garlic and chilli; less than half lakh for sweet potato, mustard, mungbean and groundnut.
- It was also evident from the results that the higher the cost the higher the profit in the case of almost all crops except okra and bitter gourd having higher cost with low profit. Sweet potato and cauliflower incurred low cost (less than taka seventy thousand) and offered comparatively higher profit (BCR more than two and net return more than taka eighty thousand). Mustard, mungbean and groundnut incurred low cost with low profit.

Post-harvest Loss Assessment of Tomato in Some Selected Areas of Bangladesh

- The major postharvest activities practiced by the farmers and intermediaries were harvesting, grading, cleaning, storing, packaging and transporting.

- The average postharvest losses were estimated to be 15.37 percent and 10 percent at the farmers' and intermediaries level, respectively.
- The harvesting loss was found highest (6 percent) as compared to grading, packaging, storing and transporting.
- Monetary loss at farmers', traders and national level was found about Tk.78540/hectare,128258/ season and 52.31 crore during 2009-10, respectively.
- Product price, farming experience and suitable packaging materials had negative and total production and rainfall had positive and significant relationship with total postharvest losses.
- Lack of storage facility, low price of tomato and unfavorable transportation system were the major problems at the farmers and traders level.

A Financial Analysis of Winter Vegetables Production in Some Selected Areas of Bangladesh

- The average yield of brinjal, country bean and radish were 29.84, 16.96 and 31.30 tons per hectare, respectively.
- The net return of brinjal, country bean and radish were Tk. 179780, Tk. 69683 and Tk. 63944 per hectare, respectively.
- The BCRs of brinjal, country bean and radish were 1.86, 1.42 and 1.50 over total cost and 2.95, 2.18 and 2.32 over variable cost, respectively.
- The cost of labour, land preparation, seed and farming experience had positive and significant effect on vegetables production.
- The major constraint for brinjal and country bean production was insect infestation and for radish it was low market price

Potentialities of Major Fruits Farming, Marketing System and Price Behavior in Hill Regions of Bangladesh

- The average farm size was 3.89 ha/farm and the average fruit garden was estimated to be 2.50 ha/ farm, which was about 64% of total cultivable land.
- Agriculture is the major source of income generating component. About 67% income comes from this sector but it contributed only about 36% of the total income. It means that the poor performance of farm related activities with seasonal unemployment were prevailed over the year.
- Local varieties and poor production practices were followed for banana, orange and pineapple cultivation. As a result, yield level for different fruits was not satisfactory. Farmers obtained 57%, 60% and 71% less yield for pineapple, banana and orange cultivation in compare to the research managed yield.

- BCR, NPV, IRR and sensitivity analysis indicates that both orange and pineapple production are highly profitable for the farmers under existing situation.
- Significant price variation was observed in the study areas. The average price of banana, pineapple and orange in accessible areas were 23%, 26% and 36% respectively higher than those of less accessible areas.
- The postharvest loss of banana, pineapple and orange were 33%, 40% and 60% higher in less accessible areas in compare to accessible areas.

Marketing System of Major Winter Vegetables in selected areas of Bangladesh

- On the basis of the intermediaries seven marketing chain were identified as a dominant.
- The chain Farmer Local Traders (*Faria*) *Bepari* *Aratdar* (urban) Retailer(urban) Consumer was identified as most dominant.
- In tomato marketing local traders, *bepari*, retailer (urban) and retailer (rural) incurred highest marketing cost than other selected vegetables due to its perishable nature.
- In case of farmers, local traders (*faria*) and *bepari* transportation cost was the highest. Commission charge was highest in case of retailer (urban) and spoilage & damage cost was highest in case of retailer (rural).
- Inadequate storage facilities, dominance of intermediaries were the major marketing problem identified by the farmers.
- Unstable price, barrier to entry in the terminal market, delay on ferryghat, spoilage and damage were the major marketing problem faced by the different intermediaries.

Study on Rural Households' Food Security in Coastal Region of Bangladesh

- The study based on a sample of 450 coastal households revealed that most households (55%) were food secured whose calorie intake (2801kcal/capita/day) was much higher than the national average (2318 kcal/capita/day).
- Among various food items, rice supplied 71.33% of the total daily calorie intake of food secured households followed by, edible oil 7.72%), sugar (5.58%), potato (3.65%), vegetables (5.18%), pulses (2.44%), and spices (1.85%).
- Logit model revealed that farm land size, farm income, off-farm income, and household crop production had positive and significant impact in attaining food security of the coastal households.
- Flood, heavy rainfall, reduction of land productivity, crop damage by rat, lack of modern technology, salinity problem and high price of inputs were found to be livelihood risks for the coastal households.

Economic Impact of Climate Change on Crop Production in Southern Zone of Bangladesh

- The mean temperature increased to 0.75 °C within 36 years i.e from 1975 to 2010.
- The rise of 1°C temperature requires 45 years.
- The rainfall was decreased in Rabi and Kharif-I season except Kharif-II.
- The highest marginal loss was estimated at Tk.3009 million due to rise in temperature.
- The total loss of Tk.7584 million was estimated due to variation in four climatic variables in the study area.
- The per hectare loss was estimated at Tk. 6482.

Adoption and Impact of IPM Technology on Bitter gourd Production in Some Selected Areas of Bangladesh

- In bitter gourd cultivation the IPM farmers yields was 6% better than Non-IPM farmers and also higher BCR (2.13) was estimated than the farmers own practices (1.94).
- About 94% farmers were willingness to increase IPM practices in future.
- Non-availability of pheromone traps was the major constraints reported by the farmers.

Impact of Agricultural Kind Support System on The Rural Farm Economy of Bangladesh

- The study revealed that 79% of farmer evaluated and supported that Aus rice production stimulus fertilizer package (Urea 20 kg, TSP 10 kg., and MoP 10 kg) system was a very good system.
- The value of that government support through NPK fertilizer was worth of Tk 766.
- The value of fertilizer package shared 15% of the fertilizer cost and 2.59% of the total variable cash cost (TVCC) and 1.47% of the without support total cost (WS-TC) which was incurred to produce per hectare Aus rice by the farmer.
- The amount of supported urea fertilizer was 20% of the total urea applied, the amount of TSP was 13% of the total TSP applied and the amount of MoP was 14% of the total MoP applied by the farmer.
- In comparison of the cash support for irrigation and kind support for fertilizer, highest percentage of the sample farmer (74%) supported that direct fertilizer support was better than cash support.
- The BCR (TVC-Cash) of Aus rice production received by the supported farmer was higher (2.04) compare to BCR (TVC - Cash) 1.98 if no support was given.
- The comparative BCR (TC) was higher (1.1) in supported farmer group compare to the 1.07 BCR (TC) of unsupported farmer group.
- Though the performance was very good but still there is room the make it more efficient because there is need to increase the amount of fertilizer and number of farmer.

Baseline Survey on Introduction of Short Duration Pulses into Rice-based Cropping Systems in Western Bangladesh

- In pulses cultivation, farmers adopted 86% improved lentil variety with 88% area coverage. Hundred percent traditional mungbean areas were replaced by improved mungbean varieties. Thirty five percent blackgram, 64% chickpea and 2% field pea farmers were cultivated improved varieties.
- The average yield of lentil, mungbean, blackgram, chickpea, lathyrus, fieldpea and gardenpea were 1349 kg/ha, 1350 kg/ha, 924 kg/ha, 1200 kg/ha, 1326 kg/ha, 1197 kg/ha and 3826 kg/ha respectively. The yields were higher than the national average.
- There is an opportunity to increase pulse production through introducing pulse crops in the existing cropping patterns such as Wheat-Fallow-T. Aman, Lentil-Jute-Fallow, Lentil-Aus-Fallow, Wheat-Aus-Fallow, and Wheat-Jute-Fallow.

Assessment of BARI developed Urea Supper Granule (USG) applicator in selected areas of Bangladesh

- The cultivation of rice through USG applicator produced comparatively higher yield, as well as higher income and less cost of production over the Non-USG applicators farmers.
- The benefit cost ratio of USG applicator farmers was found higher compared to Non-USG applicators farmers.
- The sample farmers were able to achieve additional yield of 0.28 t/ha by using USG applicator and this yield gain further resulted in additional benefit of Tk. 4263/ha.
- The probability of adopting this technology is significantly influenced by extension contact, number of training and experience in the household.
- Forty nine percent of the respondents were willing to adopt the USG applicator practices in the future.
- Clogging of USG applicator in muddy soil due to heavy weight, USG applicator is not available timely, number of missing hill by USG applicator, required labour, USG is not proper time, need frequent washing, these were the problem by using USG applicator in the study areas.

A Study on Identifying the Biophysical constraints to Pulse crops Production In Some Southern Part of Bangladesh

The study was conducted in three southern pulse growing districts namely, Madaripur, Barisal and Jhalokathi of Bangladesh during the period of 2011-2012 to assess the profitability, farmer attitude and biophysical constraints to pulse cultivation. The study revealed that farmers used different fertilizers doses which were

significantly below the BARI recommended doses for almost all types of pulse crops. The average yields of pulses were also below the national average except blackgram. The average yields were 592 kg/ ha for lentil, 335 kg/ ha for mungbean, 612 kg/ha for chickpea, 680 kg/ ha for grass pea and 969 kg/ ha for Blackgram respectively. Gross returns were Tk. 33176, Tk. 21775, Tk. 33995, Tk. 14119, and Tk. 55718 per hectare for lentil, mungbean, chickpea, grass pea and Black gram, respectively. Benefit cost ratio on full cost basis were 0.85, 0.53, 0.78, 0.39 & 1.77 and Considering variable cost basis it were 1.57, 1.00, 1.37, 0.77 and 3.51, respectively. Attack of insect, disease infestation, infected by weed, early tidal water damage (especially in Barisal and Jhalokathi districts), lack of knowledge about cultivation, scarcity of quality seed, damage by wild or domestic animal were the major constraint to higher yield of pulse crops in the study areas.

Growth and supply response of summer vegetables production in Bangladesh

The area indices an overall upward trend over the period from 1989-1992 to 1998-2001. The area under pumpkin, brinjal and lady's finger slightly decreased in 2001-2004 compared to the base year of 1986-1989 (Table 1). According to table 1, the greatest increase was in lady's finger, rising from 100 in 1986/89 to 307 in 2007/2010. However, the area indices for *jhinga*, *karala* represented an impressive increasing trend over the period from 1986-89 to 2009-2010.

Economic profitability and input output relationship of bottle gourd cultivation in some selected areas of Bangladesh

- BCR on full cost TC basis were found 2.95, 2.99 & 2.89 and net return (Tk/ha) 587364, 567810 & 530260 in Narshingdi, Comilla & Bogra respectively for bottle gourd production.

Agricultural Economics Division, BRRI

Farm Level Evaluation of Modern Rice Cultivation in Bangladesh

Modern rice varieties covered almost 97% of the total Boro area in 2011-12. BRRI varieties covered 74% area. BRRI dhan28 and BRRI dhan29 were the dominant varieties covering 33 and 31% area respectively.

In Aus season, modern rice varieties covered about 72% while the coverage of BRRI varieties was 43%. BRRI dhan28, BR2 and BR1 were the dominant varieties covering 15, 7 & 3.68 percent area respectively.

In T. Aman season, the coverage of MVs was 70% of which BRRI varieties covered 44%. BR11 was the prominent variety covering 22% area.

Average yield of MV Boro, T.Aman and Aus were 5.04, 3.58 and 3.49 t/ha respectively.

Estimation of Costs and Return of MV Rice Cultivation at Farm Level

Per hectare human labor costs were Tk 37766, Tk. 36329 and Tk 44246 for MV Aus, MV T.Aman and MV Boro rice cultivation, respectively.

Irrigation costs of MV Boro and MV Aus were Tk 13986/ha and Tk 2086/ha respectively. The yield were 3588 kg/ha, 3956 kg/ha and 5509 kg/ha from MV Aus, MV T. Aman and MV Boro crops, respectively.

Farmers received Tk.82035/ha, Tk. 74250/ha and Tk. 56252/ha gross return from MV Boro, MV T. Aman and MV Aus rice, respectively. Net returns were Tk. -21550/ha, Tk. 3892/ha and Tk. -12977/ha for MV Boro, MV T. Aman and MV Aus respectively.

Hybrid Rice Technology and Its Sustainability at the Farm Level

Area under hybrid rice has been declining in all districts over the period, 2002-2011. Area under BRRI dhan29 and other MVs has been fluctuating over the same period. Although, the yield performance (about 7.00 t/ha) of hybrid rice and MVs varied in different districts, the yield of hybrid was higher than BRRI dhan 28 (5.00 t/ha) and BRRI dhan 29 (6.00 t/ha). The higher yield of hybrid resulted to lower unit cost of production compared to MVs in all districts. Mean difference in all types of costs and return of hybrid and MV rice varieties were statistically significant at 1% level. Result of tobit analysis indicated that contact with the extension service and participation in training was positively significant in continuation of hybrid rice cultivation. Almost all the producers showed their enthusiasm to continue growing hybrid rice only expecting better yield.

Long term growth analysis of food grains in Bangladesh

During the period of 1971-72 to 1983-84, the growth of area for Aus, Aman and Boro showed declining trend; While the growth of production showed increasing trend, and this upward trend was due to rapid dissemination of developed modern varieties. However, input subsidy introduced by government resulted to enhance food grain production.

Significant differences were observed in the area, production and yield of different cereal crops during two periods "pre and post establishment of BRRI". This change defined as structural changes and it was also observed during 1984-85 to 2009-10 due to structural reform introduced by World Bank and input subsidy program by the government of Bangladesh.

Socio-economic assessment/validation of rice technology needed for the farmers in the project areas

In southern region, major cropping patterns were Rabi/Khesari-T.Aus-T.Aman, Rabi-Fallow-T.Aman,

Fallow-T.Aus-T.Aman and Boro-Fallow-Fallow, indicating there is a lot of scope to grow rice and other crops in the Boro and Aus seasons. Whereas the major cropping patterns in northern region were Boro-Potato-T.Aman, Boro-Fallow-T.Aman, and Tobacco-Jute-T.Aman.

The farmers of Barisal region need mainly insect, disease resistant and longer seedlings varieties along with harvester, transplanter, applicator of USG, dryer etc; while the farmers of Rangpur region need mainly insect, disease and drought resistant varieties with long seedlings harvester, transplanter, USG applicator and dryer.

Effect of Rice Based Technologies on Farm Income under Changing Climate in Drought-Prone Areas (Rajshahi) of Bangladesh

All the technology users reported that they were very enthusiastic to use the given variety for next season. It was found that the average volume of sale of Aman paddy (1.09 ton) was higher after the project intervention compared to than that of (1.69 ton) before the project. Average production of Boro was lower in 2011 (4.08 ton) compared to than that of (5.03 ton) in 2010 due to cold and drought problem. Almost all the producers reported that the seed quality was very good compared to the traditional seed. However, the T. Aman growers received higher gross and net return (Tk. 21339/ha and Tk.8365/ha) after project intervention.

Agricultural Economics, BSRI

Comparative Advantage of Sugarcane, Sugar, Gur and By-products Production in Bangladesh

The study was carried out for every cropping year from 2007-08 to 2011-12 to estimate the comparative advantage of sugarcane, sugar, gur and by-product production. It is observed from the study that highest cost of production incurred in sugar (3,50,620Tk./ha) followed by gur (Tk.2,47,000 /ha) and juice production (Tk.2,40,000/ha). Per hectare net return in sugarcane, sugar, gur, and juice production are Tk.31,432, Tk.(-)1,41,740, Tk.98,800 and Tk. 2,48,000, respectively. The highest BCR is obtained in juice production (2.00) followed by gur (1.40) production. It is concluded that juice production is the most profitable and then gur production.

Economics of Fertilizer use In Sugarcane Production and its Impact on Sugar Yield in Some Selected Areas of Mills Zone in Bangladesh.

The study was conducted in the six sugar mills area of Bangladesh. The study was carried out to observe the economic impact of use of recommended doses of fertilizer in sugarcane cultivation. It is observed from the study that out of 180 farmers, 66 (36%) farmers used recommended doses of fertilizers (N,P,K) and 114 (64%) farmers did not used recommended doses. The farmers, who used recommended doses of fertilizer, achieved

sugarcane yield of 67.22 ton/ha which is 28.02 ton/ha more than the farmers who did not use recommended doses. In case of net return, Tk. 42,103/ha was obtained by the farmers who used recommended doses of fertilizer and Tk.15,332/ha who did not use recommended doses of fertilizers. It is concluded from the study that use of recommended doses of fertilizer has great impact on yield and profitability in sugarcane cultivation.

A Study on Backward and Forward Linkages Opportunity of Sugar Industry Development in Bangladesh

The study was conducted during the period of 2009-11. Data were collected from different secondary sources. It was found from the study that during the period of 1971-72 to 2010-11, on an average, sugarcane was cultivated in 80.05 thousand hectare of land and produced 3594.07 thousand ton of sugarcane in mill zone and per hectare yield was 44.71 ton. During this period, on an average, average 196.17 thousand ton of sugar was produced by crushing 1822.51 ton (51% of total cane) of sugarcane. The highest domestic sugar and *gur* production was 205 and 454 thousand ton respectively in 2001-02. At that time, govt. has imported 210 thousand ton of sugar. As a result per capita sugar and *gur* consumption was 6.53 kg. In 2010-11, total supply of sugar and *gur* was 1961 thousand ton against the demand of 1950 thousand ton. Per capita sugar and *gur* consumption was 13 kg per annum. It is observed that although sugar production in the country is decreasing but per capita consumption is increasing.

Trend, Growth and Supply Response of Sugarcane Production In Bangladesh

The study was carried out to determine the trend, growth and supply response of sugarcane in Bangladesh. Secondary data were used for the study. Data were collected from different sources (BSFIC, BBS, BB, DAM and BSRI) on sugarcane production, sugar recovery, sugarcane price, profitability of competing crop during the period of 1975-76 to 2010-11. It is observed from the study that positive and significant growth rate is found in sugarcane production and yield. It is negative and significant at 5% level in case of sugarcane area, recovery and price (deflated). In spite of decreasing trend of sugarcane area, production was positive and significant due to increasing trend of sugarcane yield.

COMPUTER AND GIS

Computer and GIS unit is involved in overall management and better functioning of ICT in terms of hardware, software, networking and database systems of BARC. The unit also plays a vital role in providing support to NARS institutes to facilitate their ICT

related activities. Some other activities of computer unit are preparation of technical specification of ICT equipment and software, evaluation of technical proposal, receiving and distribution of those. Apart from this, the unit also organizes various training programs in the field of ICT for capacity building of personnel at BARC and NARS institutes. Geographic Information System (GIS) related activity is another important component of the computer unit.

During 2011-12, the computer unit carried out crop suitability and zoning studies of 17 crops using GIS which helped to prepare the document "Land Suitability Assessment and Crop Zoning of Bangladesh". The unit also provided active support for procurement of ICT equipment and establishment of Data Centre at BARC under NATP. This also includes establishment of Local Area Network (LAN) and Virtual Private Network (VPN) connectivity among BARC and 7 NARS institutes. The ultimate goal is to establish BARC Data Centre as information hub of NARS in order to strengthen agricultural research management system.

Establishment of ICT and MIS facilities at NARS

Computer & GIS unit provided necessary support to PCU, NATP for procurement, installation and commissioning of ICT equipment. The equipment like Server, PC, Laptop, Printer, Router, Switch, Firewall etc. is installed at BARC and 7 NARS institutes. Local Area Network (LAN) is set-up in each of these organizations and Virtual Private Network (VPN) is established between BARC and each of 7 NARS institutes. In order to cater information need for respective stakeholders and create information hub, Data Center is established at BARC as per required standard. The ICT infrastructure thus created can now be used for deployment of MIS, Video Conferencing and other ICT related services of NARS.

The unit is providing active support for outsourcing process of MIS development for NARS which will be deployed at the BARC Data Center and individual NARS institutes. The MIS will cover different modules like research management, financial, inventory, human resources, library, procurement, training, vehicle management, agricultural technology, gene bank related information management. Once the entire system is operational, it will help policy makers, planners, research managers of NARS organizations to run their day-to-day activity as well as overall decision making in a planned and well-organized way resulting enhancement of institutional efficiency and governance.

The eventual goal for establishment of ICT and MIS facilities is to enhance the efficiency and effectiveness of the National Agricultural Research System (NARS).

Implementation of Global Plan of Action for the Conservation and Sustainable utilization of Plant Genetic Resources for Food and Agriculture

Computer and GIS unit was involved in this project “National Information Sharing Mechanism (NISM) on the implementation of Global Plan of Action (GPA) for the conservation and utilization of plant genetic resources for food and agriculture in Bangladesh” to share information related to Plant Genetic Resources for Food and Agriculture (PGRFA). During 2011-12, Computer and GIS unit was actively involved in providing necessary support for the development of NISM-GPA database and website (<http://pgrfa.mycnw.com>). The database thus developed has been uploaded in the PGRFA website (<http://www.pgrfa.org/gpa/bgd/welcome.htm>).

Land suitability assessment and Crop Zoning

The main purpose of the activity was to delineate suitable areas for growing particular crop in order to harvest maximum potential yield. Wherein soil, land and climatic factors were considered and the limiting factors for those with respect to crop requirement were determined on the basis of expert judgment. Subsequently, suitability maps of different crops are produced by upazilas and districts.

The crop zoning maps were produced considering the percentage of the total cultivable area of the upazila under each crop suitability classes. In classifying the crop zone some criteria were followed which are described in the book “Land Suitability Assessment and Crop Zoning of Bangladesh”. The crop zoning provides the opportunity to grow the selected crops in different zones according to suitability. The crop suitability maps thus produced show the potential areas under different class which are as follows.

Very suitable: > 80 percent of maximum attainable yield (MAT)

Suitable: 60-80 percent of MAT

Moderately suitable: 40-60 percent of MAT

Marginally suitable: 20-40 percent of MAT

Not suitable: < 20 percent of MAT

The upazila wise area coverage of 17 crops under different suitability classes and zones were generated in tabular form. This will help devising appropriate policy for implementation of crop zoning at the upazila level. It is expected that crop zoning will help decision makers to take decision for expansion/reduction of a particular crop based on the suitability output.

Application of GIS for farm productivity enhancement through land suitability assessment of major cropping pattern of Bangladesh (SPGR Sub-project)

The Computer and GIS Unit is implementing this sub-project under SPGR of NATP. The main goal of the

project is optimization of present utilization of agricultural lands through GIS based technology. However, the objective of the project is to provide information to the farmers on the choice of rotation of their crops that ensures increased of food production thus maximizes the farmer's income. More specifically the project objectives are: 1) Updating and validation of the land/crop suitability database in order to derive appropriate farming practices for sustainable socio-economic condition. 2) Development of a user friendly GIS based tools (software) for land suitability assessment.

There are two major components of the special study (a) baseline/benchmark survey of the study area (six upazilas) and (b) development of GIS based tools (software) for land suitability assessment. The activities for the proposed study are given below:

(a) Conduct baseline/benchmark survey of the study area includes: Collection of primary and secondary data on the surface and ground water resources, seasonal inundation depths and duration, climatic information, soils, landforms, agriculture and socio economic parameters. Satellite imagery need to be acquired and analyzed to gather relevant information of the study area. Development of databases includes: Database on DEM and land type, hydrological/meteorological parameters, Soil and landforms, Agricultural database, Socio-economic database, Crop and land suitability database, Development/Updating of the database of crop suitability through field verification and also utilizing the research findings made by the National Agricultural Research System (NARS) Institutions.

(b) Development of GIS based tools (software) for land suitability assessment includes: Preparation of land type and land use map using DEM data and satellite images, Preparation of soil, land, climate and socio-economic maps, Development of GIS based software for determination of land type, Development of GIS based software for production of Land suitability maps and Field validation of GIS based tools (software) for land suitability assessment.

Based on the major agro-ecological regions of the country both under extensive farming practices as well as vulnerable/potential areas (drought, salinity, water availability, soil condition, cropping pattern, marketing facilities etc.) six upazillas from the following districts has been selected for the proposed study:

1. Dinajpur (Parbotipur)
2. Bagerhat (Mollahat)
3. Tangail (Ghatail and Tangail Sadar)
4. Jessore (Bagherpara)
5. Comilla (Laksham)

The sub-project activity is under progress. The hiring of

firm for conducting the baseline/ benchmark survey and development of GIS tools is under progress.

Establishment of Agricultural technology information network in Asia

Agriculture including fisheries and livestock is the main source of earnings for majority people of Bangladesh and continues to be the mainstay of Bangladesh economy. The use of ICT systems in these sectors is very much essential to reap its unutilized potentials and thereby improving the socio economic conditions particularly of the rural people. Proper initiatives need to be taken to utilize ICT systems in agricultural research, and dissemination of agricultural technology, agribusiness development to the farmers and preparation and maintenance of agricultural databases. This will help strengthen the agricultural information services thereby facilitate quick dissemination of knowledge and experience to different stakeholders. It is needless to say that availability of information on promising agricultural technology and management practices at the doorstep of farmers at right time will have significant impact on the crop productivity resulting improvement of the livelihood of farmers. To materialize this, there is no alternative to ICT to reach each and every farmer with needed information at an appropriate time.

In global context, the development of ICT has proven its potentials for enhancing development efforts, but also virtually reduced the distance and turned the world into a global village. The establishment of web based agricultural technology information network, an initiative taken by AFACI can turn out to be an important gateway for sharing of knowledge and expertise among the member countries and the globe.

In this context, agricultural technology information has been collected to publish agricultural technology handbook. Publishing process of the book is in progress. Also the content preparation of agricultural technology and uploading of the same in locally developed AFACI website is in progress. Besides, the work for constructing new website of BARC (Bangla and English version) using state-of-the-art web 2.0 technology is initiated.

Maintenance and Updating of BARC Web site

The work is being carried out as a routine job. Various changes are made time to time to make the website more informative and up to date. Circular, tender information, notice etc. are uploaded as required.

Design and development of BSRI website

BSRI website is developed at a moderate level using PHP and Mysql platform. It is a dynamic website. Provided help for hosting the site at Bangladesh Computer Council (BCC). Also, provided training to BSRI personnel on the control panel use, uploading page to the site, change management of the site etc.

Network administration and Internet/Email management

System Administration for smooth functioning of LAN and Internet/Email services is being done as a routine activity. During this period, necessary support and maintenance has been provided for smooth operation of network and internet/email system. As part of this activity, internet connectivity of 4 Mbps bandwidth with optical fiber is established through BTCL. Also 16 Real IP is purchased from BTCL for accessing various services through Domain Controller, File Server, Database and Application Server located at the Data Centre of BARC.

Climatic & Ground water database

The climatic data of 2009-10 on cloud, humidity, rainfall, sunshine, temperature, wind direction etc. were purchased from BMD. Data editing, filtering and restructuring is in progress. The climatic data will be uploaded in the BARC website upon completion of data processing.

Maintenance and updating of existing database

During this period, online inventory management system including store management has been developed using PHP-MySQL software. Data entry into this system is under progress. Using the system, all types of procurement information, goods and equipment information, stocks/distribution, maintenance of equipment etc. can be managed online. The information on the availability of particular items including repair/maintenance of equipment can be viewed online by the user.

Online Payroll Management System for monthly salary module has been completed. Data entry is going in parallel with the existing legacy payroll management system. After successful operation of the new system it will be ready for live operation. Development of other modules (Loan and CPF) is in progress.

Online Research Management Information System (RMIS) has been developed. Data gathering and data entry is in progress. The information on the ongoing and completed agricultural research projects implemented by NARS and universities will be accumulated and maintained in the system. This will help researchers to devise new project based on the related works done before and guide the decision makers to avoid research duplication.

Continuation of GIS Activities

Maintenance, necessary updating and output preparation of AEZ land resources database and local level Upazila Nirdeshika Database (soil, land, nutrition and others) is continuing as an on-going activity. GIS based land suitability assessment and crop zoning work is a part of this activity.

Support to BARC and different component of NATP as PEC and TEC member

Necessary support has been provided to the Proposal Evaluation Committee (PEC), Tender Evaluation Committee (TEC) as member and act as convenor of receiving committee.

Support to Division/Sections of BARC for Hardware/Software; Data analysis; Multimedia presentations; Information Sharing and Resource Management for Hardware/Software;

- Support provided to different divisions/sections to fix and troubleshoot various types of computer hardware and software problems.
- Several types of maps and data of land resources, climatic and other information have been provided to scientists/researchers/extensionists as per requirement.
- Word-processing, PowerPoint presentation and other software related support given to different divisions/sections of BARC.

Support for planning, budgeting and procurement of computer resources (hardware, software & accessories etc.)

- Prepared annual requirement plan and budget of computer accessories of BARC and provided support for procurement of computer hardware, software and other accessories.
- Support has been provided for procurement of computer hardware, software and other accessories under different projects of BARC. Similar support has also been provided to the Krishi Gobeshona Foundation (KGF). As part of the procurement process the specification and budgeting of computer hardware, software and other equipments have been done.

Field monitoring of programs/activities

A. As a team leader of monitoring team formed by Planning & Evaluation division of BARC, Md. Abeer Hossain Chowdhury, Director, Computer & GIS unit monitored the implementation progress of SPGR sub-projects under NATP implemented by BARI, BRRI, BAU and SAU.

The SPGR sub-projects are as follows:

- Genetic Enhancement of Sugarcane for Sustainable Productivity through Tissue Culture and Molecular Marker Techniques
- Utilization and Management of Sugar Mills Effluent water for Irrigation purposes to increase crop production
- Identification and Utilization of QTLs from Rice Wild Relatives for High Yield through Use of Microsatellite Markers

- Identification of Existing Races of *Pyricularia grisea* and Gene Pyramiding for Durable Blast Resistance in Rice
- Development and Utilization of Bangladesh Rice Knowledge Bank (BRKB)
- Molecular characterisation of Tomato Yellow Leaf Curl Virus (TYLCV) in Bangladesh and development of TYLCV resistant tomato using recombinant DNA technology;
- Development of integrated disease management technologies for soil borne pathogens;
- Integrated crop management for the improvement of Jackfruit;
- Carbon sequestration in soils of Bangladesh
- Development and validation of integrated pest management technologies in vegetable crops: A Coordinated Project
- Generation of short duration high oil content high yielding doubled haploid (DH) rape seed through microspore embryogenesis)
- Pyramiding bacterial blight resistant genes into the genetic background of BR 11-derived submergence tolerant rice lines

Core Research Activities

- Development of short duration high yielding and high yielding Boro rice varieties through induced mutation
- Organic amendments for upland crops under light textured soils in char
- Up scaling of summer onion bulb and seed production technology at farm level

B. As a team member of monitoring team formed by Planning & Evaluation division of BARC, Hasan Md. Hamidur Rahman, Senior System Analyst monitored the implementation progress of SPGR sub-projects under NATP implemented by BARI, BRRI and SAU

The SPGR sub-projects:

- Molecular characterisation of Tomato Yellow Leaf Curl Virus (TYLCV) in Bangladesh and development of TYLCV resistant tomato using recombinant DNA technology;
- Development of integrated disease management technologies for soil borne pathogens;
- Integrated crop management for the improvement of Jackfruit;
- Carbon sequestration in soils of Bangladesh
- Development and validation of integrated pest management technologies in vegetable crops: A Coordinated Project
- Generation of short duration high oil content high yielding doubled haploid (DH) rape seed through microspore embryogenesis)

- Pyramiding bacterial blight resistant genes into the genetic background of BR 11-derived submergence tolerant rice lines

C. As a team member of monitoring team formed by Planning & Evaluation division of BARC, Md. Shohid Uddin Bhuyan, System Analyst monitored the implementation progress of SPGR sub-projects under NATP.

The SPGR sub-projects:

- Development of salt tolerant rice varieties through induced mutation and marker assisted selection
- Assessment of Post-harvest Losses and Improvement of Post-harvest Practices of Major Fruits and Vegetables of Bangladesh

Coordinated project on improvement of agroforestry practices for better livelihood and environment: BARC, CU, BAU, KU, BSMRAU, BJRI, and BFRI (Forest), Components

NUTRITION

Project Development/Project Financing

Contaminants and adulterants in food chain and their mitigation (co-ordinated SPGR sub project)

In the recent years, contamination and various unethical practices of adulteration processes in food has emerges as an issue for the national food security, health, food crop productivity, economy and development of the nation as a whole. Ensuring food safety is of paramount importance for human health and thus for better quality of life. Irrespective of its origin of production, safe food always contributes equally for better quality of health and life. Due to the health consciousness of the consumers, the demand of safe food has been increasing rapidly all over the world since last 80's. For the last decade, in Bangladesh, increasing buying capacity and willingness of consumers to get safe food in one hand and on the other hand, high rate of population increase and increasing gap in demand and supply of food indulging the producers and traders to a greater extend to involved in food chain for various unethical practices which has been ultimately inviting risk against national food safety. As a result, the public health all over the country has become at high risk due to such immoral use of

hazardous adulterants and contamination process in the food items of various origin.

Now a days, there is much concern about artificial ripening of fruits. The use of hazardous chemicals with higher dosages on fruits and vegetables has become a vulnerable issue in the country.

In the fisheries sub sector, costal and fresh water aquaculture has evidence to contaminate from the culture environment by antibiotics, nitrofurans and various toxic and odd smell producing bacteria. Application of formalin on the body surface of fish has become common practice to keep the fish stiff and fresh looking for a longer period.

In case of livestock product marketing in Bangladesh, slaughter house management does not have any regulatory frame work that need to be developed to ensure production of good quality carcasses and safe hygienic meat. The most commonly used and marketed popular fast food items of animal origin in Bangladesh, in most of the cases, prepared under poor hygienic environment which is considered responsible for outbreaks of various diseases after ingestion. In Bangladesh most common practice of food adulteration is i. Mixing with non-food ingredients ii. Substituting with under quality food substances or fabrication iii. Texturing to mask the poor quality or under processing iv. Adding decomposed foods to fresh foods v. Misleading level of food ingredients on the packet vi. Misrepresentation of food composition vii. Using health

hazardous agent in foods as preservatives viii. Application of coloring and flavoring chemical adulterants in food items.

Grain quality of rice, the staple food of the country, is important both for internal and external market. The physicochemical and eating properties are influenced by contamination of grains. Heavy metals are an important source of food contamination and health hazard. The main threats to human health are associated with exposure to arsenic, cadmium, lead, copper and mercury.

In case of processed foods, harmful chemicals, non-permitted preservatives, inorganic colors are randomly being used to make the foods tasty and self-stable. Non-

permitted food colors and other adulterants at a very high dose being used in all sorts of popular processed foods in Bangladesh.



Pictorial views of SPGR sub-project activities by BARI

Keep in mind the situation narrated, the Nutrition Unit of, BARC to ensure safe food for the nation by generating research based information for the policy makers, producers, traders, processors and consumers, has undertaken the present study covering five principal areas of food and food processing like rice grain, poultry and meat products, fish and fishery products, processed foods products and fruits and vegetables etc.

Objectives of the sub project

The broad and general objective of the sub project is to mitigate contaminants and adulterants in food chain and awareness building of producers, traders, processors and consumers. To fulfill the broad objective, the sub project is obliged to perform the following specific objectives which are:

- i. Collect and collate the information derived through the component sub-projects to understand the present scenario and activities;
- ii. Development of communication materials for wide awareness building of producers, traders and consumers;
- iii. Organize disseminating training workshop/ seminar and capacity building on food safety and quality.
- iv. Co-ordination and monitoring of the component project activities to facilitate smooth implementation.

Results so far obtained by the sub-projects components are briefly describe below:

Over the last few decades, food adulteration has become a common practice throughout the world. Fresh and raw food items as degraded rapidly, may create crisis by increasing demand-supply gap in food of the world population, if not followed scientific manner of preservation and shelf life increasing practices. In this regard few adulterate agents and their process of practicing contributing positively, while in majority cases, as in Bangladesh, adulteration in food chain became appears as a threat to the human health, because of unethical use of hazardous agents in food items which has been increasing at a very high rate. With a view to identify the sources of contaminants and to reflect the scenario of adulteration practices in various fresh and processed food items and to develop mitigation measures, the coordinated sub-project of Nutrition Unit of BARC started working since May 2011 with the financial support from SPGR. To cover the diversified areas of food production, processing, preservation, marketing and consumption the sub-project included five major areas (as research components) for addressing the prevailing contamination and adulteration issues of the food chain. The component institutes involved in the research are BARI, BRRI, BFRI, BLRI and BAU. During last one year, the sub project as a whole, to achieve the goal and objectives, performed diversified activities like research implementation, organizing

training and workshop, HRD activities, monitoring of research activities, strengthening of research facilities of the component institutes and selection and recruitment of project contractual staffs and expert etc.

The sub-project unit monitored the component project activity at regular intervals, organized workshop on review of progress of the components projects and arranged workshop at national level on various food safety issues and prepare draft recommendation for future action. As per its routine activity the sub project unit completed its procurement activities of the year, prepare review notes on the draft National Food Safety Policy-2012 of the government and various other relevant issues like formalin application and its retention level in fruit and vegetables under variable conditions. In addition to that, to gather knowledge and to observe the field situation, the monitoring team also studied the fish product markets of Kuakata (Patuakhali) and mango production and marketing areas of Rajshahi, Chapai Nawabganj districts with special emphasize to adulteration practices.

BARI conducted base line survey to assess the present status of the usage of synthetic pesticides and ripening chemicals in selected fruits (mango, banana, pineapple) and vegetables (tomato, brinjal, country bean, bitter gourd). Major fruit growing areas/districts namely Tangail, Bogra, Rajshahi and Chapai Nawabganj were selected for fruits and seven districts like Gazipur, Bogra, Rajshahi, Jessore, Narshingdi, Comilla and Jamalpur were selected for vegetables. For fruits, a total of 270 growers/traders having 90 from each district were selected randomly and for vegetables, a total of 320 growers/traders having 45 from each districts were selected randomly for the study.

Almost all of the fruit growers except pineapple and all of the vegetables growers were used synthetic pesticides such as cypermethrin, chlorpyrifos, emamectin benzoate, spinosad, imidachlorpid, thiamethoxam, chlorantraniliprole, etc for protecting their crops from pests. Generally, farmers of the study areas were applied pesticides and ripening chemicals with much higher dosages and frequencies (for fruits, 10-15 times and for vegetables, 8-30 times) than the recommendation. In case of fruits, most of the banana and pineapple growers used PGR like planofix, superfix. ripen-15, tomtom, promote, etc during fruit development to enlarge the fruit size. While the pineapple growers further applied ripening agents in fruit before 3-4 days of harvest for attraction and uniform color development. Few traders (10-15%) applied ethephon in premature mango after harvest. Most of the tomato growers in the study areas (Rajshahi and Jessore) applied PGR/ripening agents mainly ethephon @2500ppm-8000ppm in immature green tomato for uniform color development to get higher price in the early market. Among 120 collected vegetables samples, 20 samples contained detectable residue (chlorpyrifos,

acephate, quinalphos, chlorantraniliprole, etc) most of which were found to be below MRL. The estimated residue level was found to be below the MRL (ethephon, 2ppm) of 30 collected fruit samples. Thirty percent samples contained their active ingredients less than 50% of the collected different groups of pesticide.

Results of laboratory experiments revealed that ethephon can be applied @750ppm - 1000ppm in breaker stage of tomato for uniform ripening within 6 days at ambient temperature ($22\pm 2^{\circ}\text{C}$). Residual level of the applied ethephon was estimated remains 0.09 ppm at edible stage, which was lower than MRL (2ppm). Similarly, for uniform ripening of banana var. *Meherbagor*, ethephon can be applied @750ppm-1000ppm at matured green stage within 5 days at ambient condition ($22\pm 2^{\circ}\text{C}$) and the residual level was estimated 0.095 ppm in both peel and pulp at marketable stage, which was much lower than MRL (2ppm).

The BFRI component of the sub project implemented to gather knowledge on contamination and adulteration in aquaculture and fish trade through screening of culture system, products and market chains. Study on sources of adulteration that would be useful to properly assess the extent of the problems in fish and fish products safety.

The consumer attitude study suggests a high degree of awareness amongst respondents on quality of fish in the market. People with higher educational background show higher degree of awareness of how the quality of fish and fish products should be maintained. A lack of confidence on the functions of government regulatory agency in testing the fish standard is also reflected in the study. The questionnaire survey showed that the awareness level among the fish farmers and dry fish producer regarding pesticide use and safety was very low. Use of formalin in fish and ice was found from big carp fish to small fish and high valued fish. At field level application during processing of dried fish, Nogos, Ripcord, Endrin, Malathion, Dimacron, sobicron etc. are widely used, while in storage of the product, DDT, Basudin and Malathion are preferred ones. Also, more than 100 chemicals and drugs are in use from fish hatchery to fish marketing. The extent of quantitative contamination in fish and fish industry is under study.



View of SPGR sub-project activities by BFRI

Study showed that formalin was use in fish or ice ranging from 0.5% to 5% level and use did not show any preference on fish species. Experimental trial for retention of formalin on fish soaked in water showed that after soaked in water for 1-2 hours the level of formalin in fish could be reduced even up to a level of 0%.

Biochemical analyses showed that about 68% of the collected fish feed samples were poor quality with adulterant feed ingredients from the both animal and plant origin. The nutritional studies revealed that the quality of the 28, 35 and 37% manufactured and marketed fish/ shrimp feeds are highly satisfactory, satisfactory and not satisfactory respectively. Shelf life study reveals that materials (feeds and feed ingredients) qualitatively degraded after two months of storage

The concentrations of organochlorine pesticides DDT and related groups were investigated to estimate the contamination of pesticide used in dry fish and their residue level. The residue level test of DDT, Heptachlor, Aldrin, Dieldrin, Hexachlorobenzene are found to exist below the acceptable limit in the dried fish sample of Silver pomfret, Ribbon fish and Bombay duck collected from three different locations i.e. Cox's Bazar, Kuakata and Khulna. Results obtained are much lower than the FAO allowable limit of 0.5 mg/kg or USFDA approved tolerance, action and guidance level of 5 ppm (USFDA 1996). The overall quality of dried fish from Khulna region was found better than Kuakata and Cox's Bazar.

Livestock and poultry origin food viz. meat, milk, egg, etc. are of the sources of both chemical and microbiological contamination, may play an important role in the transmission of drug residues and disease producing microorganisms to human. Therefore, investigation was carried out to identify the presence of adulterants in milk and meat available in the market of selected locations. To determine the contaminants and adulterants in milk and meats available in the market under selected locations such as Dhaka, Savar, Gazipur, Pabna, Sirajganj and also Super Markets in Dhaka & Chittagong cities, liquid milk samples marketed by different companies such as Milk Vita, Aarang, Farm Fresh, Pran, Tatka and Super Dairy were collected and analyzed in the Lab. by using Lactostar machine. The bacterial load in the samples was determined through culture in nutrient agar & EMB agar using pour plate method and heavy metal such as Cr, Pb and Cd by using AAS. All the data were analyzed through Statistical Package SPSS (version 11.5) and Descriptive and LSD test were performed to determine the mean differences. Results of fat content analysis indicated that all Brand samples fat content varies between a standard level of 3.53 to 3.61% except the Super Dairy (3.28%) and Tatka (3.40%). Lactose and SNF % was found as per recommended levels. The milk samples collected from different areas of Bangladesh were also analyzed and

found that all samples contained low level of fat (2.94 to 3.44%) and protein (2.93 to 3.22%) compare to the recommended level except the milk of Chittagong local market. Lactose (3.49 to 4.35%) and SNF were found below (6.40 to 8.42%) against the recommended levels in milk collected from local market of Savar, Gazipur and Pabna. Milk sold by Vendors revealed that 100% milk samples of Savar, 60% of Pabna and 25% of Sirajganj were contaminated with formalin and almost all milk samples collected from different locations were adulterated with water those varies between 40 to 100%. Water adulteration practice found highest in Gazipur followed by Savar local market and Pabna.

The bacteriological study of milk samples revealed that the total viable count (cfu/ml sample) was higher (1.38×10^5 to 8.4×10^7) in the milk of local markets of different locations and brand products, as well. The count of Milk Vita production was exceptionally high (9.75×10^6). The coliform count in all most all the collected liquid milk samples was within the standard value compared to the recommended level (<50) except Dhaka local market (249 cfu/ml), Super dairy, Chittagong (430 cfu/ml) and Chittagong local market (430 cfu/ml). Regarding the presence of heavy metals like Pb, Cd and Cr both in Brand and Local milk samples indicated that the presence of Pb and Cd in all milk samples detected at trace amount level. In case of Cr, its presence in samples of all sources found below the detection level.

On the other hand, the bacteriological study of raw meat (beef) samples collected from different departmental shops and open markets revealed that the total viable count and total coliform count (cfu/mg sample) exist in high level in all cases those studied at two different times of sample collection (i.e. 8.00 and 11.00 am). Broiler meat collected from both Farm and Market under Joypurhat location revealed that the presence antibiotic residues such as Ciprofloxacin and Sulfonamide were higher in market level compared to farm level.



Pictorial views of SPGR sub-project activities done by BLRI

To Understand the status of rice grain and food contamination as well as grain quality to focus its impact on human health and to determine the

contamination of rice grain/foods and its influence on grain/food quality in different conditions, BRRI component of the sub project conducted research to estimate the presence of heavy metal contamination in rice, residual effect of pesticides in rice grain and the fungal association, toxin production level and grain quality at storage. A survey was also conducted to gather baseline information on the existing pest management practices, industrial activities, industrial waste and fertilizer management of the sampling sites using a pretested questionnaire and through direct interviewing of related stakeholders.

Both industrial and non-industrial sites were considered for rice grain and straw sampling in the selected districts and further rice food samples were collected from the traders of five different districts markets. All samples were processed for heavy metals (Pb, Cd & Cr). Heavy metals particularly Lead and Cadmium studied from the paddy field samples of industrial area reveals that level of these two heavy metals present in the samples are within the FAO/WHO recommended level (7 and 25 $\mu\text{g kg}^{-1}$ body weight week⁻¹ respectively). Average content of Lead and Cadmium in the study samples are 0.60 and 0.22 μg^{-1} .

Aspergillus, Penicillium, Rhizopus, Fusarium value showed infection level of those fungi was below 3.0%. Results indicated that milled rice of different origin stored in different govt. storages are contaminated with heavy metals at different degrees. Fungal infection was not increased significantly with the increase of storage period. The amount of mycotoxin in milled rice was much lower than the maximum permissible limit 30 g/kg rice. The content of aflatoxin ranged from 5.46-8.57 g/kg rice. Out of 34 samples tested, only 5 sample was found infected. Results obtained so far indicated that milled rice stored in the government store are safe for human consumption considering mycotoxin production specially aflatoxin content in rice.

Results of samples analyzed so far showed the level of presence of heavy metals, fungal association and aflatoxins are below MRL. However, complete results of all samples analysis will reflect the true picture of contamination.

Assessment of the contaminants and adulterants in selected processed food products of fruit and vegetable (Jam, Jelly, Juices, Pickles, Ketchup) spices powder (turmeric, chili, zinger, coriander and mixed spices) and miscellanies products (Mustard oil, coconut oil, Chanachur, ice-cream, puffed rice and chocolate) done by BAU component. A baseline survey conducted among food processes, food factory managers, traders, retailers, consumers, academicians, doctors, scientists and researchers. Six survey research analysts (SRA) conducted the survey among 1054 respondents using

pretested questionnaire. According to opinion of respondents, more than nine diseases are associated with consumption of adulterated processed food products. The respondents' evaluation on processed food products are highly adulterated with artificial sweeteners, artificial flavors, harmful food colors, excessive preservatives and other non-permitted and harmful chemicals in foods. It is evident from the study that due to intake of adulterated processed food products, the highest possibility is suffering from Cancer (16.68%), which is followed by High Blood Pressure (13.54%) and Chronic Nephritis (12.26%), Headache (11.31%), Intestinal Upset (10.49%) and so on. The preventive measure need to be undertaken to control adulteration in processed food products indicated by respondents are "Adopting BSTI standard" (22.34%- highest), "Enforcing law and imposing punishment" (21.98%) and "Social motivation of food consumers" (20.35%).

Four commercial brands of fruit juices (Danish, Frutika, ACME, and Frootu), three brands of tomato ketchup/sauces (BD, Ruchi and PRAN), five brands of jam [pineapple (BD), mango (BD), apple (Ahmed), pineapple (Pran), and mango ((Pran)], two brands of jelly [Pineapple (Ahmed) and Mango (Nur foods)], five brands of pickles [Jujube and Tamarind (BD), Mango and Jujube (Pran) and mango (Ruchi)] and One brand of squash (Ahmed) were collected from local market. The chemical parameters of fruit juices, such as total soluble solids, artificial sweeteners, harmful food colors, acidity, preservatives (sodium benzoate, potassium-meta-bisulphite), selected minerals content (arsenic, lead, copper, zinc and tin), and microbial load such as total plate, yeast and mold counts of different brands of products were carried out in the laboratories of Departments of Food Technology and Rural Industries, Biochemistry and Microbiology and Hygiene, Bangladesh Agricultural University, Mymensingh, BSTI, Tejgoan, BCSIR, Lab., Danmondi, Dhaka and SGS Bangladesh. The commercial brands of Jam, Jelly and squash samples tested in laboratories were found to contain artificial sweeteners and less quantity of pulps/juices than that of reference value of BSTI standards. In pickles samples fluid portion was higher and acidity lower than that of reference values. In samples of juices, natural fruit juice content was lower and total plate, yeast and mold counts were higher than that of reference value. Total soluble solids,

acidity and coliform count of tomato ketchup were higher than that of reference value of BSTI standards.

Project Implementation

Dr. Md. Monirul Islam Director (Nutrition) working as a associate co-coordinator of BARC-BFRI co-ordinated SPGR sub-project entitled "Contaminants and adulterants in food chain and their mitigation".

Policy Level Contribution

Expert Committee

The Nutrition Unit contributed much in several programs on nutritional advocacy, motivation of rural households and project design by the Bangladesh Agricultural Research Institute (BARI), Bangladesh National Nutrition Council (BNNC), Institute of Food Science and Technology (IFST) of BCSIR, ICDDR'B and few NGOs working at the grassroots level.

National Level Collaboration And Linkages

Nutrition Unit continued to be closely involved in the process of programme development, review mechanism of various food and nutrition related activities of NARS and relevant institutes. Besides, the unit is also involved in planning and organization of activities undertaken by the institutions, like, DAE, BNNC, IFST, ICDDR'B WFP, INFS, etc., working in the field of food and nutrition, food safety, primary health care, food habit and cooking practices.

Dr. Md. Monirul Islam Director (Nutrition) involved as the member of the Sectional Committee on "Oils, Fats and Allied Products" of Bangladesh Standards and Testing Institution (BSTI). He actively contributed in the process of developing standards of different oils, fats and their allied products.

Research Management And Coordination

As a part of the yearly activities, Nutrition Unit was involved in the review, monitoring and participatory program development of the nutritional activities of the DAE, DAM, BAN-HRD, BNNC, and ICDDR'B. As Director (Nutrition) took part in BARC's centrally monitoring of the supplementary research funding program and SPGR funded programme during the reporting year.

II. HUMAN RESOURCES DEVELOPMENT

Crops

Training on Rice and Wheat Cultivation in Unfavourable Ecosystem

A two-day long training programme on rice and wheat cultivation in unfavourable ecosystem was organized by Crops Division, BARC during 27-28 November 2011. The main objective of the training programme was to improve knowledge and skills of the scientist/officials working on rice and wheat cultivation for unfavourable ecosystem. A total of 30 participants from BARC, BRRI, BARI, DAE and BADC attended the training programme. Dr. Md. Khalequzzaman Akanda Chowdhury, Member Director (Crops) highlighted the impact of climate change and mitigation measures need to be undertaken for rice and



Chief Guest, Dr. Wais Kabir, Executive Chairman, BARC giving certificates among the participants

wheat cultivation. He mentioned that suitable variety and management practices especially for rice and wheat needs to be developed for unfavourable ecosystem. In this two-day training programme, 10 (ten) theoretical classes were conducted covering varietal development, pest management, improved cropping system with management packages, developed farm machinery, quality seed production of rice and wheat. Expert scientists/officials from BARI, BRRI and BADC in relevant fields were invited as resource speaker. The training programme ended amidst a certificate giving ceremony where Dr. Wais Kabir, Executive Chairman, BARC was present as Chief Guest. He reiterated the need of such training in crop improvement programme in rice and wheat cultivation under unfavourable ecosystem.

Training on Food Safety and Phytosanitary Measures

A two-day long training programme on Food Safety and Phytosanitary Measures was organized by Crops Division during 13-14 December, 2011 at the Conference Room No. 1, BARC, Dhaka. The objective of the training programme was to improve knowledge and skills of scientist/officials who are involved in food safety and phytosanitary activities in the country. A total of 35

participants from BARI, BRRI, BJRI, BSRI, BINA, BADC, DAE, SCA, BRAC, Lal Teer Seed Ltd., Hortex Foundation and BARC attended the training programme. Dr. Md. Khalequzzaman Akanda Chowdhury, Member Director (Crops) briefly presented the importance of adopting phytosanitary measures at different stages viz., production, processing, transport, marketing, etc. He mentioned that national Maximum Residue Limits (MRLs) urgently need to be developed and SAARC MRLs may be followed unifiedly. Dr. Chowdhury urged MRL expert to initiate a project proposal in order to develop national MRLs. In this training programme, 9 (nine) theoretical classes were conducted including plant biosecurity, marketing techniques for safe foods, MRLs, contaminants and adulterants in food chain, functions of national and international plant protection organization/convention, rules and regulations of food safety issues in Bangladesh. Certificate giving ceremony was taken place at the end of the training programme where Dr. Wais Kabir, Executive Chairman, BARC was present as Chief Guest. He emphasized the need of more training in the field of food safety related issues. Dr. M. Khalequzzaman A. Chowdhury, Member-Director (Crops) presiding the concluding session of the training programme stated that plant biosecurity measures need to be undertaken as regular research programme and also in educational curricula. Besides, he emphasized the importance of following the international standards of food safety measures in all aspects of food production. In general, knowledge on phytosanitary measures needs to be upgraded. At the same time, the government should take necessary measures to reduce food adulterations for ensuring human health.

Training on Post-harvest Management of Fruits and Vegetables

A two-day training programme on Postharvest Management of Fruits and Vegetables was organized by Crops Division during 25-26 January 2012. The objective of the training programme was to improve knowledge and skills of scientists/officials on postharvest losses of fruits and vegetables and their management. A total of 35 participants (researchers from NARS institutes, university teachers, officials from DAE, BADC, Hortex Foundation, private companies, etc) attended the programme. Dr. Md. Khalequzzaman Chowdhury, Member Director (Crops), BARC highlighted the importance of minimizing postharvest losses of fruits and vegetables toward achieving food security in the country. He stated that at present the average annual postharvest losses go up to 20% for fruits and 25-30% for vegetables, and so minimizing such huge losses starting from crop production to its consumption is an important issue. In order to minimize

the postharvest losses of fruits and vegetables, close cooperation among the researchers, extension and private sector personnel are needed. A total of 11 theoretical classes were conducted in two days training. The lectures covered farmers' innovative technologies, assessment of postharvest losses, harvesting, transport, packaging, storage, processing, preservation, value addition, marketing of processed fruits and vegetables, quality requirements of fresh fruits and vegetables for export, risks and benefits of artificial ripening of fruits at pre- and postharvest stages, pesticide residues and food safety in fruits and vegetables. Dr. Wais Kabir, Executive Chairman, BARC distributed certificates and urged the participants to give proper attention to the reduction of postharvest losses of fruits and vegetables.



Dr. Wais Kabir, Executive Chairman, BARC giving certificate to a participant of the training

He suggested that stronger linkages among the scientists of NARS institutes, public and private sectors need to be established. Dr. Kabir hoped that the capacity of stakeholders will be increased through effective training but such training must be fruitful for the end users. Participants opined that they were mostly benefited from the training programme by gathering new knowledge and ideas on improved postharvest management techniques of fruits and vegetables. Some participants suggested to include more lectures on food processing.

Training on Seed Quality Management

A 3-day long training programme on Seed Quality Management was organized by Crops Division, Bangladesh Agricultural Research Council (BARC), during 21-23 May, 2012 at BARC, Dhaka. The objectives of the training programme were to upgrade knowledge and skill of scientists and officers involved in seed research, development and marketing sector. A total of fifteen resource persons from BARC, BARI, BADC, BSMRAU, SCA, MOA, DAE and ACI Seed Ltd. delivered lectures on the training course. Important aspects of seed quality management, agronomic consideration, seed (including hybrid seed) production and multiplication techniques of seed health and pest management, seed processing and storage techniques, seed certification system, seed business and marketing,

seed policy-ordinance-rules of major crops were included in the lecture schedule. Forty participants from DAE, BADC, BARI, BRRI, SCA, BINA, BSRI, BJRI,



Distribute certificate among the trainees on Seed Quality Management

ACI Seed Ltd., Lal Teer Seed Ltd., Supreme Seed Co. Ltd., BRAC and BARC were attended the training course. The participants attended the training courses were highly encouraged by learning different aspects of quality seed management. They suggested extension of the training course including visit to commercial seed production and processing farm. Dr. Wais Kabir, Executive Chairman, BARC distributed certificates among the trainees.

Research achievement of past ten years of pulse and oilseed crops and their future research strategies for sustainable crop production and food security

A two-day long workshop on “Research achievement of past ten years of pulse and oilseed crops and their future research strategies for sustainable crop production and



Mr. Monjur Hossain, Secretary, Ministry for Agriculture addressing in the inaugural session of the workshop

food security” organized by the Crops Division, BARC was held during 20-21 March 2012. Mr. Monjur Hossain, Secretary, MoA was present at the inaugural ceremony as Chief Guest. Dr. Wais Kabir, Executive Chairman, BARC presided over the opening ceremony of the workshop. Two keynote papers on “Research & Development of Pulses: Past, present and future” and

“Research and Development of Oil Seeds: Recent past, present and future” were presented by Dr. M. Matiur Rahman, Former Director General, Bangladesh Agricultural Research Institute (BARI) and Dr. Md. Shahidur Rashid Bhuiyan, Professor, Dept. of Genetics and Plant Breeding, Sher-e-Bangla Agricultural University (SAU), Dhaka, respectively. About 70 participants of scientists, extension personnel, professors, experts and delegates from private seed companies took part in the workshop. The objective of the workshop was to know the achievement so far made in pulses and oilseeds crops both in public and private sector, and to make recommendation for the future research on pulses and oilseeds for sustainable production towards achieving food security of the country. Mr. Hossain in his opening speech reiterated the need of more pulses and oilseed production emphasizing food and nutritional security of the country. The chief guest emphasized the expansion of both the crops in *charland* should be given priority. He also mentioned that NARS institutes, universities, DAE and BADC should work together for the development of pulse and oilseeds crops. He thanked BARC authorities for taking this initiative. Dr. Kabir stated that pulses and oilseeds areas could be increased simultaneously by decreasing boro rice cultivation and increasing aus rice cultivation. He emphasized international cooperation for exchanging germplasm and human resource development. Twenty technical papers were presented in the technical sessions by BARI, BRRI, BINA, BSRI, DAE, BADC, SCA, BAU, BSMRAU, SAU, BRAC and Lal Teer Seed Co. Ltd. The following recommendations for pulse and oilseed crops are given below:

- Collection, conservation, characterization and utilization of the germplasm of pulse and oilseed crops;
- Development of climate resilient varieties and technologies for pulses with high yield potential, and short duration of mungbean in Kharif-I, blackgram in Kharif-II, chickpea in Barind and Sylhet area, cowpea, mungbean, lathyrus varieties in the Southern districts, similarly, groundnut, sunflower and soybean for oilseed crops in the southern region.
- Development of high yield potential, short duration, resistant/tolerant to insect pest and disease varieties of oilseed and pulses for target areas and patterns;
- Improvement of postharvest handling, storage, and processing of pulses to reduce losses and retain quality; and development of new machineries for mechanized cultivation;
- Production of breeder and quality seed of improved varieties, and establishment of seed multiplication farm;
- Reduction of yield gap through application of appropriate production technologies;

- Strengthen scientists’ skills through providing higher training specially on plant breeding;
- Establishment of linkages with national and international organizations.

Annual progress of the project “Development of Variety, Cropping System and Technology Transfer of Major Cereals for Sustainable Food Security in Bangladesh”

A day long workshop was organized by crops division, BARC on 20 June, 2012 at BARC conference room-1 to review the annual progress of the AFACI food security project. About 50 scientists and officers from BARI, BRRI, BARC, DAE & BADC participated in this workshop. Dr. Md. Abdul Hamid, Additional Secretary (PPC), MoA was present as Chief Guest in the inaugural session of the workshop. Dr. Wais Kabir, Executive Chairman, BARC presided over the session and Dr. M Khalequzzaman A Chowdhury, Member Director (Crops), BARC welcomed the guests and delegates. He mentioned that 5 projects are being implemented by NARS Institutes and 6 new projects have recently been approved by AFACI, Korea which will be implemented very soon. Dr. Mian Sayeed Hassan, PSO (Crops), BARC and Co-PI of the project highlighted the AFACI food security project activities. Dr. Hassan mentioned that during 2011-12, BRRI conducted 7 experiments on



Mr. Md. Abdul Hamid, Additional Secretary (PPC), MoA attended as Chief Guest in the inaugural session

varietal improvement of Boro and T. Aman rice, 3 on cropping systems, and 3 on technology transfer. WRC, BARI conducted 3 experiments on varietal improvement of wheat and 3 on technology transfer. DAE conducted demonstration on new wheat and boro rice variety at Bagerhat. BADC produced quality seeds of boro rice (BRRIadhan 29) at Modhupur. Mr. Hamid urged the scientist/extension officers to develop technology and disseminate with full sincerity and dedication so that Bangladesh can be an example of the Asian countries regarding agricultural development. He also mentioned that modern technology could be shared among member countries. Dr. Wais Kabir urged the scientists to use the good agricultural practices and postharvest technology

by adopting of new technology and sharing knowledge with Asian countries. He also emphasized the strong linkage between research and extension for the dissemination of the technology through this type of project in order to achieve desired agricultural production. He thanked Mr. Hamid to take the initiative of full membership of the AFACI. In the technical session, Bangladesh Rice Research Institute (BRRI) and Bangladesh Agricultural Research Institute (BARI) presented annual progress report and programme (2012-13) by Dr. Md. Abdul Momin, PSO, BRRI and Dr. Naresh Chandra Barma, PSO, Wheat Research Centre, BARI respectively. Besides, Dr. Binoy Kumar Sen, Deputy Director (Extension), Department of Agriculture Extension (DAE) and Mr. Abul Hossain Mollah, DGM (Seed), Bangladesh Agricultural Development Corporation (BADCO) also presented their progress report and programme of the cropping year. After threadbare discussions, the following suggestion/comments were made:

- DAE will set up demonstrations of wheat (Var. Bijoy, BARI Gom 25 & 26 in an area of 9 hectare) and boro (area 5 ha) in 2012-13 in the same Upazilla (Fakirhat). WRC, BARI will provide wheat seeds
- Manuscript for wheat and rice cultivation for unfavourable ecosystem booklet and AFACI at a glance should be published within July, 2012.
- Production programme on wheat (5 hectares) at saline area of ARS, BARI/adjacent farmers' field of Satkhira to be undertaken in 2012-13.
- Experiments on LCC/ AWD of BRRI should be dropped.
- BADCO will produce seeds of rice (Bina dhan8/BRRI dhan 47) and wheat (BARI Gom 25/26) in 2012-13. Two tons seeds of BRRI dhan29 produced by BADCO, will be given to DAE for distribution to the farmers.
- T. Aman variety (Bina dhan7/BRRI dhan 33/56/57) may be included in wheat- jute-T. aman cropping pattern (BARI part) programme.
- Country focal point will be nominated from BARC to co-ordinate all AFACI activities.

Review Workshop of Development and Up Scaling of Integrated Pest Management (IPM) Technologies in Vegetable Crops

A day-long review workshop of IPM sub-project "Development and Up Scaling of Integrated Pest Management (IPM) Technologies in Vegetable Crops" organized by Crops Division, Bangladesh Agricultural Research Council (BARC) was held on 28 May, 2012 at BARC Conference room-1. The objectives of the workshop were i) to evaluate research progress of IPM activities during 2011-12, and ii) to develop research programmes of 2012-13. Dr. Md. Khalequzzaman A.

Chowdhury, Member-Director (Crops) and Coordinator, IPM sub-project chaired the workshop where Dr. M. A. Sattar, Director General, BINA was present as Guest of Honour. Coordinator advised four regional scientists to



Dr. M. Khalequzzaman A Chowdhury, Member Director (Crops), BARC addressing as Chairman of the workshop

collect data and improve the presentation of the results systematically. Dr. Sattar emphasized on the dissemination of IPM technologies to major vegetable growing regions of Bangladesh and gave preference to farmers' training on IPM technologies.

Dr. Syed Nurul Alam, Head of Entomology Division, Bangladesh Agricultural Research Institute (BARI) presented a keynote paper on brief introduction to IPM sub-project. A total of twenty six participants from BARC, BARI and BINA attended the workshop. Participants of the workshop emphasized on several issues viz., inclusion of Plant Pathologist in the project, exploring the effects of IPM activities on biodiversity at least two research regions, easy availability of sex-pheromone, and publication of book, leaflet/booklet on IPM technologies. Following suggestions were made in the workshop: i) collection of information/data on variety name of vegetables and time of planting, ii) time, dose and pre-harvest interval of pesticide application, iii) name of farmers who had applied pesticides, iv) time of releasing bio-control agents, v) incorporation of farmers' comments/suggestions, and vi) incorporation of comparative data on income & expenditure in the final report.

Review Workshop on Crop Improvement Programme of NARS Institutes

A two-day review workshop on "Crop Improvement Programme" was held at BARC during 27-28 August, 2012. Dr. Wais Kabir, Executive Chairman, BARC opened the inaugural session as Chief Guest. Dr. M. Khalequzzaman A. Chowdhury, Member Director (Crops) chaired the inaugural session. Dr. Abul Kalam Azad, Chief Scientific Officer (Crops), BARC cordially welcomed all participants to the workshop. Dr. Kabir gave special emphasis on the crop improvement programme for achieving high crop productivity and food security in the country. After the inaugural session,

four technical sessions viz., varietal improvement through conventional breeding of cereal crops, oilseeds and pulses; horticultural crops; cash crops; and crop improvement through biotechnology were included in the workshop. About 60 scientists of NARS institutes attended and respective scientists presented research activities (2011-12) and research programmes (2012-13). All major crops such as rice, wheat, maize, sugarcane, jute, oilseed, pulses and horticultural crops were included in the programme. Dr. Chowdhury, Member Director (Crops), BARC chaired the technical sessions. Dr. M. Matiur Rahman, former Director General, BARI, Dr. Md. Shahidur Rashid Bhuiyan, Pro-Vice Chancellor, Sher-e-Bangla Agricultural University, Dr. M A Khaleque Mian, Professor, BSMRAU and Dr. Rakha Hori Sarker, Professor, University of Dhaka were presented as expert members of the respective technical sessions. After threadbare discussion, some major recommendations made are as follows:

- Use of biotechnology for the development of insect and disease resistant crop varieties should be increased.
- Research programme as well as a new project on variety development for industrial effluence may be undertaken.
- Research on the development of drought, submergence tolerant crop varieties need to be strengthened.
- Breeding programme should be target oriented like high yield; disease-insect resistant and desirable grain size etc.
- Quality breeding for high protein and other nutrients should be intensified.
- For incompatible *Brassica* materials more genetic variability is to be included.
- Programme needs to be taken for the development of disease resistance in groundnut.
- Hybrid development programme should be undertaken based on the consumers' preference.
- Mutation breeding program to be taken in case of spices and flowers.
- Breeding for low lignin content in jute variety is suggested to include in the future programme.
- Tissue culture programme related to creation of somaclonal variation in sugarcane should be continued.
- BINA should give maximum thrust to create variability through mutation.

Review Workshop on Plant Protection Programme

A two-day review workshop on plant protection programme of NARS institutes was held at BARC Conference room-1 during 29-30 August 2012. Dr. Wais Kabir, Executive Chairman, BARC was present as the Chief Guest. Two expert members on Entomology and two on Plant Pathology reviewed the programme. The workshop was chaired by Dr. M. Khalequzzaman A.

Chowdhury, Member Director (Crops), BARC. Scientists of NARS institutes (BARI, BRRI, BJRI, BSRI and BINA) presented their research progress (2011-12) and research programme (2012-13) on entomology and plant pathology, respectively. Dr. Chowdhury advised researchers to investigate the ecological impacts of pesticides usages. He emphasized on the evaluation of marketed pesticides and advised scientists of Entomology and Plant Pathology Divisions, BARI to undertake a joint research project for the establishment of bio-control and climate change facilities. In Chairman's speech, Dr. Kabir emphasized on safe and quality food production programme in mainstream of agricultural research. He urged to develop regulatory system for the private sectors at farm-gate level so that safe agricultural products would be available in the market. BARI and BRRI should give attention on the evaluation of agro-chemicals. In mainstream agricultural research, climate change, crop simulation modeling and crop forecasting should be included in the research programme. After threadbare discussion, some suggestions were made by the participants as well as expert members. Some major recommendations are given below for plant protection:

A. Entomology

1. IPM Research Center as well as bio-control laboratories need to be established in the regional stations of BARI.
2. Monitoring and survey on egg masses of brown plant hopper should be carried out since it is a major pest of rice.
3. BINA, BSRI and BARI should work together on pesticide residue management to avoid duplication. Measurement of pesticide residues of chewing varieties of sugarcane should be undertaken.
4. The effects of 'K' rich fertilizer, sterile insects and bio-control agents should be used in combination for pest management.
5. BSRI can collect *Bracon habetor* from BARI and can determine its effectiveness against sugarcane borer.
6. Status of sugarbeet mite and insect pests should be determined.

B. Plant Pathology

1. Experiments on chemical control need to be reduced.
2. Physiologic race identification, characterization and genetic variability of major pathogens need to be carried out by NARS institutes.
3. Studies on post-harvest diseases and loss incurred of major crops are to be taken up.
4. Coordinated disease management programmes should be developed between Plant Pathology Division and Crop Research Centers of BARI.
5. For IDM against bacterial wilt of potato, soil and seed treatment need to be included as components of IPM.

6. Research programmes should be initiated on behavioral change of disease/pathogens under changing environmental conditions, both in field and in greenhouse condition with manipulated temperature, humidity of different AEZs

C. General Recommendations

1. In developing research programmes, priority setting document prepared by BARC should strictly be followed and the programme needs to be modified accordingly.
2. Emphasis on the screening of mutants of different crops against major insect pests diseases is very essential. So, it should be considered as priority programmes before releasing a variety.
3. Avoid duplication with BARI, BRRI, BJRI and BSRI on research activities.
4. Coordinated research programmes are to be taken up by the NARS institutes to harness more effective results.

Inception Workshop on Characterization of Important Plant Genetic Resources

A-day long inception workshop on Characterization of Important Plant Genetic Resources was held at BARC on 28 March 2012. Dr. Wais Kabir, Executive Chairman, BARC opened the inaugural session as Chief Guest. Dr. M. Khalequzzaman A. Chowdhury, Member Director (Crops) chaired the inaugural session. Dr. Kabir emphasis the morphological and molecular characterizations of varieties/germplasm would be helpful in developing improved varieties or for the improvement in the existing varieties. He also advised the more cooperation among the institutes and published important research findings at the end of the project. In his speech, Dr. Chowdhury pointed out to collect detail information such as area and location of cultivated GI crops should be documented properly. In technical session, PI of each of the six components institutes presented their inception report. Important decisions of the workshop are as follows:

- BARI would characterize 42 GI crops (mango-9, betel leaf-15, litchi-4, banana-5, satkara-2, lemon-3, hog palm-1, lotkan-1, bael-2) and molecular characterization of two crops (mango-9, mungbean-19)
- BINA would characterize 57 varieties and 221 lines/germplasm of 12 crops and two GI crops (mungbean var. Sonamoog and blackgram)
- BRRI would characterize 22 GI crops, released varieties and landraces
- BJRI would characterize all released varieties and GI materials of Jute, kenaf and mesta and 100 accession of Jute germplasm
- BSRI would characterize released varieties, germplasm and 2 GI crops
- BAU would characterize 24 fruit crops of 64 varieties and 603 germplasm and three GI crops (jube).

TTMU

Training on Production technology and Orchard Management of Mango: During 3-4 December 2011, Technology Transfer Monitoring Unit, Bangladesh Agricultural Research Council (BARC) organized a training Programme at Satkhira DAE training hall on "Production technology & Orchard Management of Mango". The objective of the training Programme was to upgrade the knowledge, skillness of mango growers regarding communication status, yield gap factors and technological gap between researches and farmers' practices. Senior Scientists from Regional Fruit (mango) Research Station, Chapai Nawabganj delivered lectures on introduction of modern mango varieties, establishment of mango orchard, inter-cultural practices, fertilizers & irrigation management, pest management, postharvest technology and marketing as resource persons. Thirty farmer participants from Satkhira Sadar, Tala & Kolaroa Upazilla were attended.

In the inaugural session Dr. Md. Abul Kashem, Director, TTMU, Bangladesh Agricultural Research Council mentioned that proper management practice of mango orchard alone could achieve the production double in this region. He also stated that arrangement would be made to continue the similar programme in future to fulfill the demand of local farmers. Deputy Director, DAE, Satkhira district Mr. Haribullah Sarker presided over the inaugural session.

Farmers' reaction (at closing session):

- i. More training programs should be organized.
- ii. Locally collected mango saplings are mostly from local variety.
- iii. Learning of fertilizer & irrigation management & plant protection measures can able to minimize the farmers' knowledge gap.

Upazilla Livestock Officers Training: According to the Annual Work Plan 2011-2012, Technology Transfer Monitoring Unit, Bangladesh Agricultural Research Council (BARC) organized a training program during 20-22 December, 2011 for Upazilla Livestock Officers at Bangladesh Livestock research Institute, Savar, Dhaka. The objective of the training programme was to update the Upazilla Livestock Officers' knowledge and latest technologies generated by the scientists of Bangladesh Livestock Research Institute (BLRI) and transfer those to the farmers' field. Scientists of Bangladesh Livestock research Institute (BLRI), Savar, Dhaka acted as resource persons on the training course. Following 6 (six) latest generated technologies in detail were included in the training schedule-

1. Cattle fattening
2. High yielding fodder production
3. Bio-security Guidelines for Animal and Poultry Disease Management

4. PPR and Goat Pox vaccines and disease prevention
5. Layer management in different stages with vaccination schedule
6. Community based Shuvra (শুভ্রা) chick production and management of laying stage.

Twenty five Upazilla Livestock Officer Participants from different upazillas under NATP of 21 districts attended the training programme. The participant opined that after a period of about 12 to 15 years they have got the opportunity to seat with the researchers. This type of training will open new pathway of linkage between DLS & BLRI. Upazilla Livestock Officers also mentioned that such kind of training would make strong bond between extension and research organizations which eventually built up an intensive communication system so that problem in field can be solved immediately. In the closing session Director General, BLRI, was in the chair where Director General, DLS acted as a chief guest.

Upazilla Fisheries Officers Training: Technology Transfer Monitoring Unit, Bangladesh Agricultural Research Council (BARC) organized training programme for Upazilla Fishery Officers' during 21-23 January, 2012 at Bangladesh Fisheries Research Institute, Mymensingh. The objective of the training programme was to update the Upazilla Fisheries Officers' knowledge and skill on latest technologies generated by the scientists of Bangladesh Fisheries Research Institute (BFRI) and transfer those to the farmers' field. Scientists of Bangladesh Fisheries Research Institute (BFRI), Mymensingh acted as resource persons on the training course. Following latest generated technologies in detail were included in the training schedule-

1. Technology of developing new Rui (রুই) variety fish from local variety through genetic research.
2. Improved nursery management of Rui (রুই).
3. Fingerlings production and production management of mono-sex tilapia fish.
4. Nursery and production management of Pangas (পাঙ্গাস), Sing (শিং) and Koi (কই).
5. Water quality and health management of fish.
6. Reproduction, cultivation and preservation of nearly degenerated fish species of Bangladesh.

Participants (Upazilla Fisheries Officer) from NATP 27 Upazillas under of 21 Districts attended the training programme. In the inaugural session the Chief Guest Dr. Wais Kabir, Executive Chairman, BARC opined that there is no alternative but use of technology. He also stated that the training programme would be a very effective tool for quick dissemination of the recent technologies generated by BFRI, Mymensingh. The Director General BFRI was the chair person and Dr. Md. Abul Kashem, Director, TTMU, BARC was in the chair of special guest. In the closing session participants thanks to BARC for arranging such training programme.

They mentioned that similar training programme should be arranged frequently so that extension personals can interact with scientists to have solutions of their problems and put opinion regarding field of research for the future as well.

Upazilla Agricultural Officers Training: A three-day long training programme for Upazilla Agricultural Officers' was organized by Technology Transfer Monitoring Unit, Bangladesh Agricultural Research Council (BARC) during 18-20, March 2012 at Bangladesh Sugarcane research Institute, Ishurdi.

The objective of the training programme was to update the Upazilla Officers' Agricultural knowledge and skill on latest technologies which were generated by the sugarcane scientists of Bangladesh Sugarcane Research Institute (BSRI) and transfer those to the farmers' field. Scientists of Bangladesh Sugarcane Research Institute (BSRI), Ishurdi acted as resource persons on the training course.

Following technologies in detail were included in the training schedule-

1. Introduction to modern varieties of sugarcane developed by BSRI, their characteristics, suitability of the varieties in different parts of Bangladesh
2. Detail agronomy & production technique and development of biotechnological research of sugarcane
3. Problem of sugarcane cultivation in Bangladesh causes of low yield and remedies.
4. Intercropping with sugarcane, seedling raise and transplanting of sugarcane.

Participants (Upazilla Agricultural Officers) from NATP 25 Upazillas under of 21 Districts attended the training programme. The Director General, BSRI, Ishurdi was the chief guest and Dr. Md. Abul Kashem, Director, TTMU, was in the chair of special guest.

In the closing session participant invaded thanks to BARC for arranging such training programme. They mentioned that similar training programme should be arranged frequently so that extension personals can interact with scientists to have solutions of their problems and put opinion regarding field of research for the future as well.

Upazilla Agricultural Officers Training: A three-day long training for Upazilla Agricultural Officers was organized by Technology Transfer Monitoring Unit, Bangladesh Agricultural Research Council (BARC) jointly from 18 to 20, February 2012 at Bangladesh Rice Research Institute, Gazipur. The objective of the training programme was to update the Upazilla Rice Officers' knowledge and skill on latest technologies which were generated by the Rice scientists of Bangladesh Rice Research Institute (BRRRI) and transfer those to the farmers' field. Scientists of Bangladesh Rice Research

Institute (BRR), Gazipur acted as resource persons on the training course. Latest generated technologies (varieties & management) in detail were included in the training schedule.

Participants (Upazilla Agricultural Officers) from 30 Upazillas under of 21 Districts attended the training Programme. The Director Training BRR was the Chair Person and Dr. Khalequzzaman Akand Chaudhury member Director (Crops), BARC was in chair of chief guest where Dr. Md. Abul Kashem, Director, TTMU, was special guest.

They mentioned that similar training programme should be arranged frequently so that extension personals can interact with scientists to have solutions of their problems and put opinion regarding field of research for the future as well.

Upazilla Agricultural Officers Training: A three-day long training for Upazilla Agricultural Officers was organized jointly by Technology Transfer Monitoring Unit, Bangladesh Agricultural Research Council (BARC) from 7-9 April, 2012 at Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh.

The objective of the training Programme was to update the knowledge and skill of Upazilla Agricultural Officers on latest Technology generated by Bangladesh Institute of Nuclear Agriculture (BINA), as well as to develop human resource of Department of Agricultural Extension (DAE) and boost up food production of Bangladesh along with minimized technological gap between Research and Agricultural Extension. Scientists of BINA, Mymensingh, acted as resource persons on the training course. Recent generated technologies in detail were included in the training schedule. Participants (Upazilla Agricultural Officers) from 28 Upazillas under of 21 Districts attended the training programme.

They mentioned that similar training programme should be arranged frequently so that extension personals can interact with scientists to have solutions of their problems and put opinion regarding field of research for the future as well.

Planning and Evaluation

Workshop on Achievement from Work Plan 2010-11 and Finalization of Work Plan 2011-12

A day long review workshop on "Achievement from Work Plan of 2010-11 and finalization of Work Plan for 2011-12" was held at BARC on 26 July 2011. Dr. Sk. Ghulam Hussain, Member-Director (Planning & Evaluation) was acted as moderator in the workshop. Dr. Wais Kabir, Executive Chairman, BARC chaired the workshop. Member Directors, CSO, PSO and others officers from different divisions/centres/units attended the programme. Each division/unit presented its

progress of activities of the year 2010-11 and the work plan of the year 2011-12. Each presentation was followed by lively discussion on matters relating to justification and usefulness of the activities undertaken. It was felt necessary to establish more coordination among different divisions /centres/units of BARC with respect to major activities.

Training on Project Development and Management

A five day-long training workshop on "Project Development and Management" was organized by the Planning and Evaluation Division, Bangladesh Agricultural Research Council, during 08-12 April 2012. Dr. Wais Kabir, Executive Chairman, BARC was present in the inaugural session as chief guest. Mr. Md. Aminuzzaman, Director (Manpower & Training) was present as special guest and Dr. Meraz Uddin Ahmed, Acting Member-Director (Planning & Evaluation)



Participants of Training workshop on Project Development and Management

presided over the inaugural ceremony. Senior Officers from different divisions of Bangladesh Agricultural Research Council were also present in the inauguration ceremony. Dr. Paresh Chandra Golder, Chief Scientific Officer (Planning & Evaluation) delivered welcome address. Dr. Md. Abdus Salam, Principal Scientific Officer (Planning & Evaluation) was the course coordinator of this workshop. Twenty five participants from the different NARS institutes including BARC attended the workshop. Resource persons were drawn from BARC, National Academy for Planning and Development, and Bangladesh Agricultural University. The course content of the training workshop included the topics on project cycle, project appraisal, logical framework, preparation of different types of project documents (DPP/RDPP/TPP), critical path method, result based monitoring, PPR-2008, financial delegations etc. The workshop was conducted based on class lectures, practical sessions and open discussions. The special guest mentioned in his speech that this training workshop was undertaken to provide some preliminary ideas to the participants in project planning and management. The chief guest in his speech mentioned that this training workshop was organized to make the participants conversant with project planning

and management. The chairperson of the training workshop in his speech hoped that this training would be helpful for the participants to prepare and manage different kinds of projects properly and efficiently. The workshop ended on 12 April, 2012 through a certificate giving ceremony where the Executive Chairman, BARC was present as chief guest.

Progress Review and Monitoring Workshop on Research and Technology Transfer programmes

A two-day long workshop on “Progress Review of Core Research Projects and Monitoring Reports under Research Grant Fund of BARC” organized by the Planning and Evaluation Division of Bangladesh Agricultural Research Council (BARC) was held during 20-21 June 2012. The objectives of the workshop were to review the research achievement of the past year (2011-12) and to identify constraints and find out possible solutions thereof in implementing research programmes.



Inauguration Session of the Progress Review and Monitoring of Research and Technology Transfer Programmes Workshop

The workshop was inaugurated by Dr. Md. Abdur Razzaque, Project Director, Project Coordination Unit, NATP: Phase-1 as Chief Guest. Dr. Md. Rafiqul Islam Mondal, Director General of Bangladesh Agricultural Research Institute was present as Special Guest. The ceremony was presided over by Dr. Paresh Chandra Golder, Acting Member-Director (Planning & Evaluation), BARC. Dr. Md. Abdus Salam, Principal Scientific Officer (Planning & Evaluation), BARC while delivering welcome address highlighted the workshop objectives and some significant achievements made by the projects. Eighty participants from the different NARS institutes, Agricultural Universities and BARC attended the workshop.

Hon'ble Chief Guest in his opening speech emphasized on proper implementation of the programmes as planned and for delivering the expected outputs. He stated that monitoring is the key tool for programme/ project success. He directed the BARC scientists to participate in the monitoring activities of the projects in time. The Special Guest urged the participants to discuss on the

programmes constructively through which some recommendations can be made for effective implementation in future. He opined that this project fund is very useful in conducting research in the research institutes. The chairperson of the session thanked the programme leaders for successful progress of the projects. The inaugural session of the workshop was followed by six technical sessions. Thirty four research papers were presented in five technical sessions by the respective programme leaders of NARS institutes, Agricultural Universities and BARC. A technical session was allocated for presentation of eight monitoring reports which were presented by the monitoring team leaders or their representatives.

In the concluding session, some recommendations were made for strengthening the activities related to the implementation and monitoring of the research & technology transfer programmes.

Livestock

TRAINING: A training with the title “Disease surveillance and diagnosis of farm animal diseases using molecular techniques” was held from April 17 to 19, 2012 at PRTC, CVASU, Chittagong with the combined effort of BARC livestock division and PRTC. There were 20 trainees (ULO and VS) from Chittagong and Barisal divisions. The training was funded by the coordinated SPGR project (BARC part) of livestock division, “A Coordinated project on the Surveillance of Important Infectious, Zoonotic and Emerging Diseases of Livestock and Poultry in Bangladesh”.

Seminar/workshop:

A day-long workshop was held on the “Progress Review Workshop on SPGR Livestock Sub-projects”. The workshop was held on June 14, 2012 at BARC Conference Room No. 1 and organized by Livestock Division of BARC. A total of eighty participants from BARC, BLRI, BAU, CVASU, SAU, Haji Mohammad Danesh Science and Technology University, Patuakhali Science and Technology University, RU, DLS, Bangladesh Veterinary Council, SAARC Agriculture Centre (SAC), Krishi Gobeshona Foundation (KGF), and NATP-PCU attended the workshop. A total of eight papers were presented in the workshop. A proceeding of the workshop has already been published. The workshop was funded by PIU-BARC, NATP Phase-1, BARC.

Fisheries

Training, workshop, seminar, training-workshop (Foreign, Local)

The Division plan and implement several training courses every year on important subjects aiming to develop the skills of various stakeholders involved in

fisheries production and processing and dissemination of developed technology. The courses are implemented with the coordination of BFRI through its different stations. However, due to the administrative turmoil of BFRI during the period, their targeted training programs were not implemented.



Working with stakeholder dialogues in Germany attended by the Member Director (Fisheries).

Several local workshops and seminars organized by different divisions of BARC, NATP and NARS institutions were attended with active participation. Contributions were made in the form of paper presentation, rapporteur of technical sessions and report presentations, facilitator in the working group, interaction as active participant, etc. A few technical events were also chaired during the participation and were Special Guests in the opening session in some of the regional workshops. Contributions were made in NATP fisheries technical committee as president and member secretary for selecting new project of fisheries.

The Member Director (Fisheries) was also attended a foreign stakeholder workshop entitled 'Working with stakeholder dialogues' in Germany and actively participated in the formulation of the future work plan and shared views among the workers of the participating countries.

Forestry, NRM

Research Review and Programme Planning Workshop of Agroforestry System in Bangladesh:

Organized a Research Review and programme planning workshop on Agroforestry system in Bangladesh at BARC on 5-6 June 2012. The objectives of the workshop were to review the research activities of Agroforestry in Bangladesh, make co-ordination among the stakeholders and avoid the duplication of the programme. Dr. Wais Kabir, Executive Chairman, BARC, was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session. Agroforestry programme of different organizations were presented, discussed and developed in the workshop.

Organized a workshop on Constraints and opportunities of Agroforestry in newly accreted char land of Bangladesh: Organized a workshop on "Constraints and opportunities of Agroforestry in newly accreted char land of Bangladesh" on 14 March 2012 at BARC. Dr. Wais Kabir, Executive Chairman, BARC was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session. Seventy participants of 35 organizations were present in the workshop. Proceeding of the workshop with valuable recommendations is being published. The objectives of the workshop were to identify the problems, prospects, research activities development of forestry practices in newly accreted char land in Bangladesh and for future research strategies on Agroforestry practices.

Organized a workshop on "Bamboo Production and Utilization: Organized a workshop on "Bamboo Production and Utilization" on 16 April 2012 at BARC. Dr. Wais Kabir, Executive Chairman, BARC was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session. Seventy participants of 35 organizations were present in the workshop. Proceeding of the workshop with valuable recommendations is being published. The objectives of the workshop were to identify the problems, prospects, research activities and development of Bamboo and future research strategies for Bamboo production and utilization.

Agricultural Engineering, NRM

Organized 2 (Two) batches training course on "Agricultural Engineering Technology (Use of Farm Machinery and Efficient Irrigation System Management)", (19-22, May and 26-29, May), 2012 at BARI, Gazipur. Farm Machinery and Post-harvest Process Engineering Division, BARI and Agricultural Engineering Section, BARC jointly organized these training courses. In each batch, twenty Agricultural Engineer's from DAE, BRRI, BARI and BMTF participated to upgrade skill of agricultural machinery use and efficient irrigation system management in the field level.



The objective of this training was to awareness development about the technologies available in NARS institutes to Agricultural Engineers, working DAE and NARS institutes

Inaugural session was chaired by Engr. Shoeb Hassan, CSO (FMP. Engg.), BARI. Dr. Md. Shiazul Islam, Director Research, BARI was present as Chief Guest.

Second batch of the training was held 05-08 March, 2011, at BARI, Gazipur. Inaugural session was chaired by Engr. Dr. Md. Abdul Wahhabi, PSO (FMP. Engg.), BARI. Mr. Md. Mokhesur Rahman, Director (T & C), BARI was present as Chief Guest. Dr. Sultan Ahmmed, CSO (Agril. Engg.), BARC was present as special guest and as well as the training coordinator for all the batches.

Workshop

Two days NARS Research Planning Workshop on Agricultural Engineering was held on 11-12 June 2012 at BARC, Dhaka Bangladesh. Agricultural Engineer's and experts from NARS was attended in the workshop. Workshop evaluated of Agricultural Engineering Research Reports (2011-12) and Planning Future



Research Program (2012-13) of NARS Institutes. The workshop was organized by the Agricultural Engineering Section, Natural Resource Management (NRM) Division, BARC. The objectives of the workshop were to review the status and needs of agricultural engineering research in Farm Machinery, Irrigation & Water Management and Postharvest Technology.

Ninety Agricultural Engineers from NARS Institutes participated in the workshops. Participants offered valuable suggestions and recommendations in various issues on i) Farm Machinery, ii) Irrigation and Water Management iii) Postharvest Technology.

Soils, NRM

Training Program on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns

Two batches of training programs on the above topic were conducted by the Soils Unit during 2011-12 for the scientists and scientific assistants of the NARS institutes. The program for the scientists was conducted during 7-8 February 2012 and for the scientific assistants during 14-15 February 2012. In the first batch

32 scientists and in the second batch 35 scientific assistants from different NARS institutes attended the programs. The programs were conducted under the SPGR Sub-Project of "Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns" funded by NATP Phase-I.

Workshop Core Research Programs of NARS

Institutes: A total of seven workshops were organized by Soils Unit of BARC during 2011-12 of which one workshop was on core research programs of NARS institutes, four workshops were on NATP funded Coordinated SPGR Sub-Projects and two were on NATP funded single component SPGR Sub-Project coordinated/implemented by the Soils Unit.

Annual Research Review and Planning Workshop of Soils Program of NARS Institutes – Core Research

Programs: A 3-day long workshop on Annual Research Review and Planning Workshop of Soils Program of NARS Institutes was organized during 12-14 September 2011 for reviewing the Core Research Programs of the NARS institutes. A total of 80 participants from different NARS institutes, senior scientists, university teachers, extension personnel, BADC officers etc. and other concerned personnel attended the workshop. Soil fertility and fertilizer management programs of different NARS institutes conducted during 2011-12 and research programs for 2012-13 were reviewed and discussed in the workshop. Following recommendations were formulated in the workshop:

- Research programs should be designed in line with the research priorities of the country set by BARC in collaboration with the other concerned organizations.
- Research programs should be undertaken based on the review of previous works, market demand and national interest.
- More research programs should be undertaken in saline areas, char lands and hilly areas and terrace soils.
- Research programs on IPNS should be strengthened for different crops and cropping patterns for sustaining soil health.
- More experiments should be undertaken by the NARS institutes on nutrient use efficiency.
- Soil Science Divisions of all the NARS institutes should undertake some basic research.
- Unified methodology should be followed for analysis of soil, plant and fertilizer samples by all the NARS institutes.
- For cropping pattern based experiments coordination among different divisions and NARS institutes should be strengthened.
- Both intra- and inter-institutional coordination needs to be strengthen.
- Research should be carried out taking into account of the changing climate.

- Research-Extension linkage should be strengthened for enhancing rapid dissemination of technologies.
- All research should be synchronized with the main stream of the respective research institute.
- Individual thinking of a researcher should be given importance.
- In the fertilizer trials economic analysis must be done before recommendation of fertilizers dose for the farmers.
- Chemistry of P, K, S and Zn in relation to plant nutrition needs to be studied.
- Research on bio-slurry should be strengthened.
- Technologies generated at the research stations should be validated in the farmers' field through OFRD.
- Research programs on isolation, characterization and use of free living nitrogen fixing microorganisms (*Azotobacter*, *Azospirillum*, *Cyanobacteria* etc.) should be undertaken for yield improvement of cereal crops, especially of rice and wheat.
- Research programs on development of stress (viz. salinity, extreme acidity, drought etc.) tolerant *Rhizobium* should be undertaken for improvement of grain legumes.
- Study on microbial characterization of soils of Bangladesh should be undertaken.
- Effect of different bio-fertilizers on soil fertility and soil health should be studied.
- Initiative should be undertaken to disseminate bio-fertilizer technologies through DAE. BARC might play a major role in this regard.
- Quantification of nitrogen fixed by different BNF mechanism should be done through ^{15}N isotope and ARA techniques.
- Studies on plant growth promoting rhizobacteria (PGPR) should be undertaken for yield improvement of major crops.
- Research programs on isolation, characterization and use of phosphate solubilizing microorganisms (PSM) should be undertaken for yield improvement of major crops.
- In case of deep placement of phosphorus, placement should be done at a time, not as split application at different stages of crop growth.
- For cropping pattern experiments, reporting and data presentation should be done for the whole pattern. Single crop data of a cropping pattern experiment should not be reported and presented.
- Treatment should be written as T_1 , T_2 , T_3 etc. not as F_1 , F_2 , F_3 etc.
- Conclusion of the experiments should be made considering the crop yield and soil properties, not only on the basis of crop yield.
- Relationship between tillage and root growth parameters should be studied and presented.
- In case of hill farming row orientation should be done across the slope, never be done along the slope. The farming practices should not aggravate deterioration of the environment and forest eco-system. The crops should be selected properly.
- Research on soil physical aspects should be strengthened in Soil Science Division of BINA and BRRI; and in SRDI.
- Findings on soil physical properties should be presented graphically rather than in tabular form.
- Unified format for reporting and presentation should be supplied by BARC.
- Soil conservation studies should be undertaken by Soil Science Division, BARI. BARC should arrange fund for such research.
- For the experiment on "Screening of Zn-Fe Rich (Bio-fortified) Wheat Genotype" location should be mentioned. Data on P value should be rechecked.
- In case of Zn bio-fortification, quantity should be mentioned.
- The proposed experiment on "Remediation of Heavy Metals in Polluted Areas through Organic Amendments" should be redesigned as per suggestion. Appropriate organic amendment should be selected. Total heavy metal content should be determined instead of available forms of heavy metals. Chemical analysis of Fern dust should be included.
- Boron may be sprayed at pre-flowering stage in the experiment on "Effect of Foliar Application of B on Fruit Quality and Yield of Mango"
- For the experiment on "Effects of K, Cu and Mo Fertilization on Bulb Yield and Tip-burn of Garlic" the design should be split plot instead of RCB.
- Soil Science Division, BARI should undertake experiments on purification of industrial polluted water for irrigation.
- Mn status of soils of Bangladesh should be studied thoroughly. BARC should arrange fund for such research.
- Assessment of heavy metal contamination in soil-water-plant system and their remediation should be undertaken by all the NARS institutes.
- Heavy metal pollution standard for soils and crops need to be fixed through collaborative efforts of all the NARS institutes.
- Experiment in hilly areas should be conducted both on hill and valley for comparison of results.
- Study on suitability of surface water for irrigation in saline area during dry season should be undertaken.
- Percent of slope should be considered during conduction of research in hills.
- Experiments on growing crops across and along the slope should be undertaken to compare the yield and land degradation.
- Relationship between available P and other elements with changing of soil organic matter and pH should be studied.
- Mn and Al toxicity in different soils should be studied except AEZ-14.

- Correlation between available P and total P should be studied since total P in some soils is too high. Total P data are required for better understanding of available P.
- Updated information on macro and micro nutrient status in soils of different AEZs are required.
- Relationship between total and available plant nutrients should be studied for better soil fertility and fertilizer management.
- Long term study on degradation of soils in respect of physical, chemical and biological properties due to intensive cropping should be undertaken on priority basis.
- Research should be conducted for K and S management in saline area.
- Al should be determined as routine analysis of soils, especially for low pH soils.
- Micronutrients, especially Mn, Al and Fe toxicity in plant should be studied.
- Agro-forestry experiments might be conducted considering soil physical and chemical parameters.
- MATH model developed by Hill Agriculture Research Station, Ramgarh might be adopted for better utilization of hills.
- SRDI should work in collaboration with crop based research institutes for doing research on crops.

Annual Research Review and Planning Workshop of NATP Funded Coordinated SPGR Sub-Projects: As also mentioned before, four NATP funded coordinated SPGR Sub-Projects are being implemented in different NARS institutes under the coordination of Soils Unit of BARC. Day-long Annual Research Review and Program Planning Workshops of all those Sub-Projects were conducted during June, 2012. Scientists from different NARS institutes, senior scientists, university teachers, extension personnel, BADC officers and other concerned personnel attended the workshop. The research programs conducted under the Sub-Projects during 2011-12 and programs for 2012-13 were reviewed and discussed in the workshops. Suggestions and comments from the workshops have been incorporated for improvement of the programs.

Workshop on Updating of Fertilizer Recommendation Guide: Updating of Fertilizer Recommendation Guide (FRG) is a mandate of BARC, which is supposed to be done at five years interval. For financial assistance in updating activities of FRG-2012 a one-year duration SPGR Sub-Project is being implemented in the Soils Unit of BARC since June 2011. Drafting of the Guide has been completed by March 2012. Two workshops were organized on the draft Guide during 2011-12. Scientists from different NARS institutes, senior scientists, university teachers, extension personnel, BADC officers and other concerned personnel attended the workshops. The draft FRG-2012 was presented in the workshops. Suggestions and comments from the participants of the workshops have been incorporated to finalize the FRG-2012.

AERS

Training Course on Econometric Analysis through Different Computer Softwares: A five-day training programme on “Econometric Analysis through Different Computer software” was organized by Agricultural Economics and Rural Sociology Division, BARC during 18-22 March, 2012. The inaugural ceremony of the training programme was held on 18 March 2012. Dr. S M Khalilur Rahman Member Director (AERS) and Mr. Abeed Hussain Chowdhury, Director (Computer) were present as chief guest and special guest respectively. Dr. Fauzia Yasmin, PSO (AERS) and course director of this training programme in her welcome address highlighted the objectives. The objectives of the training were to find out appropriate method for analysis, determine the accurate result and find out the actual finding related with Bangladesh agricultural situation. A total of 18 participants from different research institutes attended the training programme. In five-day training programme, 27 lectures were delivered. The lectures covered different aspect of economic issues that included statistical applications through different computer software such as E-view, STAT & SPSS, researcher from NARS and Professor of relevant field from Bangladesh Agricultural University, Mymensingh, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Asha University, Dhaka and United International University, Dhaka were resource speakers.

Workshop on Review of Socio-economic Research Programmes of NARS Institutes: A day long Workshop on “Review of Socio-economic Research Programme was held at BARC on 28 June, 2012. Dr. Wais Kabir, BARC chaired the inaugural session, where Mr. Monzur Hossain, Secretary, Ministry of Agriculture and professor Dr. Md. Idris Ali Mia, Dean., Agricultural Economics and Rural Sociology Faculty, BAU were presented as a chief guest and Special guest respectively. Dr. S M Khalilur Rahman, Member Director (AERS), BARC welcome the participants and briefed the objectives of the Workshop. The workshop aimed at strengthening the future research programme relating the climatic change. The objectives of the workshop were to implement research programmes properly and in time and take necessary attempts; to give suggestion for future research programmes and to avoid the research duplication among different institutes. Eighty (80) participants from different NARS Institutes BARI, BRRI, BJRI, BLRI, BINA, BSRT and BFRI were attained in the workshop. Twenty Eight papers on research progress/achievement and 33 future research papers regarding socio-economic aspects were presented by concerned presenters of the above mentioned institutes. Two technical sessions of the workshop were chaired respectively by Dr. Rezaul Karim Talukdar, National physical and social Access Advisor, NFPCSP, FAO and Dr. Md. Abul Quasem, Ex. Senior Research Fellow, BIDS, Agargaon, Dhaka followed by the closing

session Dr. Wais Kabir, Executive Chairman, BARC. Several recommendations were drawn on the basis of the valuable suggestion made by the scientists and expert members from different institutions.

After discussion a number of recommendations were reported by the Rapporteurs 1.: Dr. Fauzia Yasmin, PSO (AERS), BARC, Dr. Tanvir Mahmud Bin Hussain, SSO, Ag. Econ Division, BARI, Md. Abdus Salam, SO, Ag. Econ Division, BRRI and Muniruzzaman, SO, Ag. Econ Division, BAR. The major recommendations of the workshop are given below:

Major Recommendations:

Considering the future of Agriculture in Bangladesh, constraints and limitation have to be identified and given suggestion for solution through analyzing different policies.

There is a deficit in policy research. Emphases have to be given on policy research to provide policy information to the policy maker. Macro level research is needed to provide policy information.

Along with to meet the institutional demand, some research works have to be taken on national issues or regarding policy issues.

Research on technology generation, its adoption and socio-economic impact is also very important.

To make conclusion at national or macro level, sample have to be national representative and methodology should be strong. There must be analytical insight to draw policy implication.

Nutrition

Dissemination of Nutrition Information among School Teachers

During the year 2011-2012, Bangladesh Agricultural Research Council and Bangladesh Applied Nutrition and Human Resource Development Board (BAN-HRDB) jointly organized a 3-day training on “Dissemination of Nutrition Information among School Teachers” in Sylhet



during 17 – 19 April 2012 and 5 day training on “Food processing and preservation of small entrepreneurs for improving nutrition and poverty alleviation” during 13-17 May and 20-24 May 2012 respectively at the conference Room of BAN-HRDB, Dhaka.

A total of 30 teachers from the greater Sylhet district of Bangladesh were participated in the first programme. The course was organized to disseminate the messages on food based nutrition with the view that acquired knowledge would be transferred to the students, which might be



transmitted to the parents and neighbours. On the other hand, a total of 60 small entrepreneurs & NGOs representatives (30 nos. in batch) were participated in the second programme. This course was conducted with the view to improve their skill and knowledge in food processing and preservation of perishable vegetables and fruits, in particular.

Mr. Shawkat Momen Shahjahan MP and Chairman of the Parliamentary Standing Committee for Ministry of Agriculture delivered speech as chief guest in the concluding session of the training programme Dr. Md. Monirul Islam, Director (Nutrition) and Mr. Md. Aminuzzaman Director (Training), were present at the Certificate at DAE Training room, Sylhet.



Workshop on “Food adulterants and Consumer Safety”

The courses included multidisciplinary sectors in the following subjects viz., agriculture products, fishery, food hygiene, sanitation, safe food and food security, improvement of nutrition level, different toxic chemicals use in foods, arsenic problems, processing and preservation techniques of fruits and vegetables, quality control, etc. were emphasized.

In these programmes, Dr. Wais Kabir, Executive Chairman of BARC and Mr. Shawkat Momen Shahjahan, MP and Chairman of the Parliamentary Standing Committee for Ministry of Agriculture were

present as chief guest in different sessions of inaugural and certificate giving ceremony. Dr. Md. Monirul Islam, Director (Nutrition) and MR. Aminuzzaman, Director (Training) of BARC was present as special guest, and the programme was presided over by Mr. Md. Mosharaf Hossain, Executive Direct of (BANHRDB).

However, to develop aware of the farmers/producers, traders and consumers, a day long workshop on “Contamination and adulteration Status in food items: Consumer safety” was organised by Nutrition unit, BARC on 27 June 2012 at the conference room-1 of Bangladesh Agricultural Research Council. The workshop was aimed to review the status of contamination and adulteration in different food items in the country and exchange of views with the stakeholders to determine a strategic path for ensuring safe food for consumers. In the workshop three keynote papers were presented on behalf of different leading organizations related to food research and consumer’s safety (title of the paper and name and designation of the presenters are shown in table 1 of the proceedings). The workshop was accomplished under two technical sessions. Dr. Md. Kabir Ikramul Haque, Member-Director (Fisheries) Chaired the inaugural session. The workshop was attended by participants and representatives from BAU, BARI, BFRI, BRRI, BLRI, BARC, NATP (PIU), SAIC, CAB, DoF, BANHRDB, NNC, Mango Foundation, Pineapple Association of Bangladesh, Hortex Foundation and representatives from various other GO and NGO. Dr. Md. Monirul Islam, Director (Nutrition) in his welcome address narrated the prevailing food safety threats of the country and emphasized research findings based consumers’ awareness building to reduce human health risk. Dr. Haque, in his speech emphasized the present day problems of quality food and human health risks. He also reemphasized the need for safe food production and expects positive contribution by the ongoing research projects of the BARC. Dr. Wais Kabir, the Executive Chairman, BARC inaugurate the workshop as Chief Guest.

In two consecutive technical sessions three keynote papers were presented as per following schedule.

Session/s	Chairman	Title of paper/subject and presenter
Technical session-I	Dr. Md. Moslem Uddin Mia, Former Director (Nutrition), BARC	1. Contamination and Adulteration in Food and Consumers Safety; Presenter: Mr. Kazi Faruk President, CAB, Dhaka 2. Status of Micro-Nutrients and Heavy Metal Contamination in Crops. Presenter: Prof. Dr. Md. Rafiqul Islam, BAU, Mymensingh

Session/s	Chairman	Title of paper/subject and presenter
Technical session- II	Dr. Wais Kabir, Executive Chairman, BARC	1. Contamination and Adulteration Status in Fruits and Crops; Presenter: Dr. Miaruddin, PSO, BARI, Gazipur 2. Presentation and adaption of workshop recommendations

Following the presentation of all the three keynote papers, a threadbare discussion held and a number of comments/recommendations made by the participants (comments and recommendations are presented below under different sub heads). Dr. Wais Kabir, Executive Chairman, BARC in his concluding remark thanked the Nutrition Unit of BARC for arranging such a successful workshop on the national issue which is very much time demanding. He also mentioned that in Bangladesh, food sector is highly poised with threats of various contaminants and adulterant agents. This is not only the responsibility of the researchers and administrators to play their part for controlling the disaster but the role of all stakeholders including consumers are equally important he mentioned. The Chairman also appreciated the ongoing research of BARC and expected that it would able to provide important feedback to the policy makers and also develop sectoral protocols to control/reduce the health risks on the basis of research findings. Finally, thanked all the researchers and participants from different agencies for their active participation and involvement with such a crucial problem of food safety of the country and expect a fruitful outcome by all of our joint efforts in near future. Finally the meeting came up with adaptation of the following recommendations:

1. As adequate guidelines and legal instruments like acts, regulation etc are not available to ensure food safety at every step, the house thus urges upon for required feedback from relevant disciplines to fulfill the gap immediately;
2. Soil-water and environment pollution are highly responsible for growing and culture food contamination process. A strong role of environment ministry may reduce the contamination process of food to minimum level;
3. To acquainted the food safety monitoring related members and media people with the chemical agents responsible for contamination and adulteration in food, their acceptance level, source and process of accumulation and mitigation, training/orientation should be organized in all the cities and district areas of the country;
4. New research findings related to food safety issues should be transmitted to the consumers level by various means like TV, radio, print media and awareness campaign etc;

5. Coordination among the agencies working in the field of food safety was emphasized to have a better and effective output of the present effort.

Computer and GIS

Training on “e-Governance, Unicode, Internet, Email” during 1-5 April 2012 was organized by Computer & GIS Unit, BARC. 40 officers of BARC attended.

Training on “Windows, MS Office and Unicode” 1st Batch: 27-31 May 2012 2nd Batch: 03-07 June 2012. organized by Computer & GIS Unit, BARC. 65 support staff of BARC attended.

Workshop on “*Online Activity Management System and RMIS*” organized by Computer & GIS Unit, BARC during 11 October 2011 40 Officers of BARC

Training, Seminar and Workshop Attended by the Scientists

Planing and Evaluation

Dr. Paresh Chandra Golder, Post Doctoral study National Academy of Agricultural Research Management, ICAR, Hyderabad, India 06 Months (27-06-11 to 26-01-12).

Dr. Md. Abdus Salam, Impact Assessment of Agricultural Research and Development UPLB, Los Banos, Philippines 18 days (08-08-12 to 26-08-12).

Dr. M. A. Awal, Agricultural Project Planning, Monitoring and Evaluation Chiang Mai University, Thailand 30 days (18-11-12 to 18-12-12)

TTMU

Attended Workshop on “Working with Stakeholder Dialogues-Building Competences for Achieving Common Goals” held on 21-24 May 2012 Berlin, Germany.

Soil, NRM

Scientists of Soils Unit participated in different training, workshop and study tour programs home and abroad organized by different organizations. The scientists of the Unit took part in sharing knowledge among the participants of these programs and provided with comments, suggestions etc. especially in the workshops and seminars. The scientists also took part in a number of discussion meetings with the foreign delegates visiting BARC. The scientists of Soils Unit imparted the following training and study tour programs home and abroad during 2011-12:

Local

1. Training on “Procurement and Financial Management of SPGR Sub-Projects held at BARC, Farmgate, Dhaka during 22-24 January 2012.
2. Training on “Seasonal Forecast Information

Development and Application” held at DAE, Khamarbari, Farmgate, Dhaka during 29-31 January 2012.

3. Training on “e-Governance” held at BARC, Farmgate, Dhaka during 01-05 April 2012.
4. Training on “Project Development and Management” held at BARC, Farmgate, Dhaka during 08-12 April 2012.
5. Training on “Seed Quality Management” held at BARC, Farmgate, Dhaka during 21-23 May 2012.

Foreign

1. 2011 PRC-ADB Knowledge Sharing Platform Agricultural and Rural Development: Improving Farm Productivity and Rural Livelihoods held at Beijing, China during 8-11 November 2011.
2. International Study Tour Program on Fertilizer Related Issues held in Thailand and India during 11-18 June 2012.

Computer and GIS

AFACI Pan-Asian Project for the “Establishment of Agricultural Technology Information Network in Asia (ATIN)” held in Lao P.D.R during 8-10 December 2011

Regional Workshop on the “Agricultural Model Intercomparison and Improvement Project” (AgMIP) held in India during 16-20 April 2011.

Training on the “Geographic Information System (GIS)” held in Singapore during 17 June-18 July 2012

Consultation workshop on updating and improvement of NISM-GPA held in India during 6-7 December 2011.

Manpower Development Activities

The major activities that Manpower and Training Unit has accomplished during the reporting period are delineated below.

Foundation Training

The closing session of the 22nd Foundation Training Course of the National Agricultural Research System (NARS) scientists was held on June 3, 2012 at Bangladesh Academy for the Rural Development (BARD) in Comilla. The course duration was from 05 February to 03 June 2012 in which 39 participants took part. The program was organized by BARD Comilla and sponsored by Bangladesh Agricultural Research Council (BARC), Dhaka. The newly recruited Scientific Officers from different NARS institutes were the participants in this course.

Presided over by Dr. AK Sharifullah, Director Administration, BARD, the meeting was addressed among others by Director Training S.J Anwar Zahid, BARD, Course Director Dr. Md. Shafiul Islam, BARD, Course Coordinator Md. Abdul Quader, BARD, Asst. Course Director Md. Mukhlesur Rahman of BARD and

Director Training of BARC Md. Aminuzzaman. Dr. Wais Kabir, Executive Chairman of BARC attended the program as chief guest. The objective of this four month long training program was to make the NARS scientists aware of the government financial and management rules during their professional life. BARD senior officers who were involved in the process of organizing and conducting this thanked BARC for financing this four month training course.

Dr. Wais Kabir, Executive Chairman of BARC during his speech describing BARD as a prestigious institution of the region said through this training the newly recruited scientists have acquired managerial knowledge and skills, although they have academic degrees in different fields. This training will help the scientists be capable enough to win the game in negotiation table at national and int'l level, Dr. Kabir hoped. He further said this training would also help you to win the game in the total agricultural development process in the country. Referring to the past agricultural research thrusts involving only some biotic and abiotic issues the chief guest said we have now refocused our research priorities in some newer areas like development of saline tolerant, heat tolerant, submergence tolerant crop varieties. Commenting the deteriorating soil quality, bio-diversity, he said you are the people who need to be shouldered to address these emerging problems. Dr. Kabir called upon the scientists to enhance their knowledge and skills because the upcoming challenge in agricultural research will be more complex and also there will be increased investment in the agriculture of Bangladesh.

Dr. AK Sharifullah, Director (Administration), BARD chaired session and congratulated the participants for their brilliant success. He hoped that this course would help the scientists become a good manager and responsible officer in their professional life. He thanked all concerned associated in making this training program a success and also thanked BARC for facilitating this kind of training course. Five participants awarded crests including one with DG Award for their good performance during the training.

Training Program on Administrative and Financial Management

BARC organized a 14-day Training Program on Administrative and Financial Management during March 23, 2011 to April 6, 2011 at Bangladesh Academy for Rural Development, Kotbari, Comilla. A total number of 18 PSOs and CSOs from different NARS institutes participated in the program. The objective of the training program was to provide these senior levels scientists/ research managers with the modern concepts of administrative and financial management system. The training program was inaugurated by Dr. S.M Khalilur Rahman, Member Director (AERS), BARC who

attended the program as the Guest of Honour. Presided over by Mr. Mohammed Mir Kashem, Additional Director General, BARD. The inaugural program was addressed among others by Director (Training) of BARD. While narrating various aspects of administrative and financial management, Dr. S.M Khalilur Rahman said this program would help increase efficiency of the NARS senior level scientists and thus good governance and productivity will be ensured in the NARS institutes.

Financial Management Training

A total number of three trainings on "Financial Management of SPGR Sub-projects" were held during 12-13 April 2011, 21-22 April 2011 and 24-25 April 2011 at Graduate Training Institute, BAU, Mymensingh, Training Division of BARI, Gazipur and BARC Conference Room-2, BARC, Dhaka respectively. These three training programs each with two day duration were attended by 20, 32 and 19 participants respectively.

In Country PhD (Revenue)

One of the major tasks of Manpower of Training Unit of BARC is to offer higher studies for NARS scientists in various disciplines of cross cutting issues of agriculture and beyond. During 2008-2009 a number of 18 in country PhD slots were offered to the scientists/professionals of NARS. Fund in this connection was released for those candidates taking admissions in the universities. On receipt of progress reports scholars' monthly allowances and research grants are being released. On completion of their Ph.D. research by 2012, it is expected that they would be able to contribute at satisfactory level in attaining food security of the country.

In Country PhD (PIU-BARC): NATP Phase 1

Under PIU-BARC, NATP: Phase-1 there were provisions of 60 national PhD scholarships in various fields of agriculture. During the reporting period all of 60 PhD scholars are pursuing their courses and research work in different public universities within the country. The PhD scholarships were distributed among the NARS institutes as BARI-25, BARI-10, BJRI-7, BSRI-5, BINA-3, SRDI-4, BFRI (fish)-4, BTRI-1 and MoA-1. It may be mentioned here that all of PhD scholars' have already completed their courses and most of them completed their field research. All costs in connection with their PhD programs were provided timely in their respective universities. The PhD scholars already completed their course work and about 80% PhD scholars have completed their field research and 70-80% of their literatures have been collected. Now they are working on data analysis, analytical work and thesis preparation work. Under SPGR sub-projects, nineteen scholars are pursuing their PhD degree in different universities in Bangladesh.

Foreign PhD (PIU-BARC) NATP

Again, under the PIU-BARC: National Agricultural Technology Project (NATP) Phase 1 a number of 30 slots were earmarked for foreign PhD programs for the scientists of National Agricultural Research System (NARS). The prospective candidates nominated by the concerned institutes of NARS were interviewed and finally selected by the same committee. Award letters have been issued and all the selected PhD scholars have taken admission in the universities of different countries like Malaysia, Thailand, China, Philippines, India and Sri Lanka. On receipt of progress reports scholars' allowances and research grants are being released. It is hoped that the scholars through their knowledge in agriculture gained abroad would enrich and accelerate the scientific advancement in Bangladesh agriculture.

Post-doctoral fellowships abroad

As per provision of NATP there are 10 post-doctoral fellowships for a period of 6-8 months of which 8 post-doctoral fellowships have been selected mainly for developing countries. Of them Dr. Paresh Chandra Golder, MD (P & E) , BARC and Dr. Md. Abdullah Yousuf Akhand, SSO, BARI have completed their post-doctoral fellowships. Selection of the remaining two candidates is under process.

Foreign Training/seminar/workshop/meeting

During the reporting period other than in country activities, Manpower and Training Unit also initiated and implemented foreign training/seminar/workshop /meeting in different countries of the globe. A total number of 32 research managers/scientists under different fields of agriculture and cross cutting issues attended to help enrich their professionalism in order to achieve the country's ultimate goal of being self-sufficient in food production. Detailed activities are furnished in annexure II.

In-country Training/Workshop (Revenue)

Besides implementing the programs abroad Manpower and Training Unit also has also initiated in organizing local training/seminar/workshops etc. in different fields of agriculture particularly through which research managers/ scientists/ administrators/ extension professionals, farmers, development partners and NGO activists have been benefited. During the reporting period, Manpower and Training Unit has arranged 12 training programs under revenue funding where 528 participants from different agencies have been benefited. Under the same funding source, a number of 12 workshop/seminars have been organized. Out of these programs, a total number of 815 persons have been benefited. Detailed activities are furnished in annexure II.

PIU-BARC: NATP Phase 1 Funded Training/ Workshop/Seminar

Participation of Seminar/Workshop/Conference Abroad under PIU-BARC:NATP Support: As per budget provisions of project, there is a provision for 30 persons for participation in the seminar/workshop abroad for a period of 5 days each maximum. It may be mentioned that during the reporting period 16 NARS scientists attended seminar/workshop abroad in different fields of agriculture in Australia, China, India, Indonesia, Turkey, Pakistan and German.

PIU-BARC: NATP Phase 1 Funded Training/Workshop/Seminar

A) Training (NATP)

As per provisions of the project and needs of the agriculture research organizations there were annual implementation plan for organizing about 35 national training programs under PIU-BARC, NPTP: Phas-1. During the reporting period, 36 national training courses were organized in various fields of agriculture with the support of the concerned divisions of BARC and NARS. These are as 1. Foundation training for NARS junior scientists as organized by BARD, Comilla. 2. Administrative and financial management training for NARS PSO/CSO level scientists as organized by BARD, Comilla. 3. Training courses on research methodology as organized by GTI, Mymensingh. 4. Training on Use of Bangla Unicode in computer, 5. Training on fundamentals of ICT and MIS, 6. Training of development of higher trainer, 7. Training on Introduction to Arc View GIS, 8. Training on M & E of Research Programs/Projects, 9. Training of Procurement and Financial Management on SPGR implementation related personnel and also others trainings were organized by BARI for NARS as stated in Annexure II. In the training courses there were 1080 participants, which include scientists, officers, procurement and financial management personnel of NARS institutes viz. BARI, BRRI, BJRI, BINA, BFRI (Fisheries), BFRI (Forest), BSRI, BLRI, BTRI, SRDI including BARC.

Seminar/Workshop (NATP)

As per provisions of the project and needs of the agriculture research organizations there were annual implementation plan for organizing about 25 national seminars/workshops under PIU-BARC, NPTP: Phas-1. During the reporting period 26 events of national seminars/workshops in various fields of agriculture were organized with the support of the concerned divisions of BARC and NARS. In the seminars/workshops 2144 participants participated from the NARS institutes viz. BARI, BRRI, BJRI, BINA, BFRI (Fisheries), BFRI (Forest), BSRI, BLRI, BTRI, SRDI including BARC (Annexure II).

Participation in Seminar/Workshop/Conference Abroad under PIU-BARC:NATP Support

As per budget provisions of project, there was a provision for 30 persons for participation in the seminar/workshop abroad for a period of 5 days each maximum. During this period 16 NARS scientists attended seminar/workshop abroad in different fields of agriculture in Australia, China, India, Indonesia, Turkey, Pakistan and Germany.

Short Training Abroad under PIU-BARC:NATP Support

As per budget provision and training needs there were about 50 scientists may be funded for short-term training abroad for a period of 1 to 2 months each during the reporting period under PIU-BARC, NATP: Phase-1. It may be mentioned that PIU-BARC has already implemented 49 (forty nine) short term training mainly for developing countries. Out of 49 scientists, 10 scientists were trained on M&E at UPLB, Philippines, 4 scientists attended GIS training in Singapore, 4 scientists on post-harvest processing and 7 scientists on soil fertility management attended training at MARDI, Malaysia and 6 research managers participated in training on research management at Chiang Mai University, Thailand. It may be noted that the scientists from the different organizations such as BARI-20, BRRI-8, BJRI-3, BINA-3, BSRI-1, BFRI (fish)-1, SRDI-3, BARC-8 and MOA-2 participated in the training courses.

Special Program

Policy Dialogue on “Prioritizing Demand-driven Agricultural Research for Development in Bangladesh”

A day-long policy dialogue on “Prioritizing Demand-driven Agricultural Research for Development in Bangladesh” was held on 23 June, 2012 at the Conference Room of BARC, Farmgate, Dhaka. The program was jointly organized by Bangladesh Agricultural Research Council (BARC), Asia-Pacific Association of Agricultural Research Institutes (APAARI) and International Food Policy Research Institute (IFPRI).

Presided over by Dr. MA Sattar Mandal, Member (Agriculture) , Planning Commission, the program was attended by the leading agricultural R&D personalities like Dr. Z Karim, former Secretary and FAO Consultant, Dr. Md. Zainul Abedin, IRRI Country Representative in Bangladesh, Dr. Mahabub Hossain, Executive Director, BARC, Dr. Mr. Mohammad Masum, Chairman and Supreme Seed Company. Dr. Sk Ghulam Hussain worked as the facilitator of the program while Dr. Wais Kabir, Executive Chairman of BARC delivered the opening address. Dr. David Spielman, Senior Research Fellow, IFPRI, Washington gave an overview about the objective of this policy dialogue. Dr. Nitish Chandra Debnath, Consultant, FAO and former Vice Chancellor, Chittagong Veterinary University Dr. M.G. Hossain, former Director General, Fish Genetic Specialist, World Fish Center, Dhaka.

III. AGRICULTURAL INFORMATION AND PUBLIC RELATIONS

AGRICULTURAL INFORMATION

BARC devotes considerable efforts and resources for the development of an outstanding library collection to meet the expanding needs of agricultural research and to serve as an information resource centre for NARS institutes.

Development of Collection

Until June 2012 the library has a total collection of 22,732 information materials, which includes books, reports, pamphlets and bound journals etc. The following information materials have been procured during the period under report:

Items	Quantity
Books and Reports	293
Current Journals/Newsletter	61

Literature Search

The Centre renders literature search services from full-text database - The Essential Electronic Agricultural Library (TEEAL) CD database to satisfy the researchers, agricultural scientists, planners and policy-makers. It also provides search services on specific requests received from teachers, students and users from NARS institutes and other organizations. The library provided search service from TEEAL to 107 external users.

Services and Users

During this period 978 users of different categories have used the library. Besides the BARC and NARS scientists, teachers and students of Universities, NGO and private organizational personnel are the users of this library.

Update and Maintenance of databases

- Database on Books and Reports contains 5,709 records out of which 28 records have been added during this year
- Database on Journals, Newsletters, and Periodicals contains 61 records and being updated regularly.

Resource Sharing

The library also performs resource sharing activities to serve the scientists. In this period, the library has collected information materials from FAO, BBS, BANSDOC and all NARS institutes.

AIC also has taken photographs of 68 workshops/training/seminars/meetings and supplied to the concerned divisions and provided 1,08,055 photocopies of official documents, reports, letters, scientific literature etc. under 3,948 requests.

Activities Relating to BJA

During this period 37 articles have been received from the authors for publishing in the Bangladesh Journal of Agriculture (BJA). The articles have been processed

following selecting reviewer/over viewer and making comparison of articles received from reviewers/overviewer after correction made by the authors.

PUBLICATIONS

Annual Report 2010-11. Dhaka, 2012

Bangladesh Journal of Agriculture. vol 36(1), 2012

Preparation/Presentation/Publication of Research Articles/Papers

Crops

Chowdhury, M.K.A., Azad, A.K. and Zilani, M.A.C. 2011. *Proceedings of the National Workshop on Research Achievement of Past Ten Years in Cereal Crops and Future Research Strategies for Sustainable Production and Food Security*. 170p.

Chowdhury, M.K.A. 2012. *Conservation and Sustainable Use Plant Genetic Resources in Bangladesh. A Cooperative Programme of Bangladesh Agricultural Research Council and Food and Agricultural Organization of the United Nations*, Dhaka, Bangladesh. 95p.

Hassan, M.S., Chowdhury, M.K.A. and Quayyum, M.A. 2012. *Progress Report 2010-12. AFACI Food Security Project in Bangladesh*, BARC. 77p.

Hussain, Sk.G., Chowdhury, M.K.A. and Chowdhury, M.A.H. 2012. *Land Suitability Assessment and Crop Zoning of Bangladesh*, BARC. 110p.

TTMU

Faroque MAA, Kashem M A and Bilkis S E. 2011. *Sustainable agriculture: A challenge in Bangladesh*. Intl. Agril. Res. Innov. & Tech. 1 (1&2): 1-8.

Hossain M.M., Kader M A and Kashem M A. 2011. *Effect of sowing date and variety on the yield of tropical sugar beet (Beta vulgaris)*. Bangladesh Agron. J. 14 (1&2): 95-101.

Haider M L, Kashem M A, Das AK Uddin and Kabir L I. 2012. *A study on integrated pest management (IPM) practices by the brinjal growers of Belabo upzilla under Narshingdi district*. Bangladesh Research Publications J. 7 (3): 212-219.

Kashem, M. A. and F. Yasmin. 2011. *Agricultural Economics, Marketing and Supply Chain Development, Sub-sectoral study series: Volume 11, Project Implementation Unit (PIU-BARC), Admin Building (2nd Floor), BARC, Farmgate, Dhak1215, Bangladesh, December*.

“DARIDRO BIMOCHONA EKTI BARI EKTI KHAMAR KRISHI PROJUKTI (দারিদ্র বিমোচনে একটি বাড়ি একটি খামার কৃষি প্রযুক্তি)”, a “technology packaged” book was

published by the Scientists of TTMU, BARC for the agricultural extension workers at grass-root level as well as for farmers to get profitable production. To compile the technologies, a national workshop was organized by the TTMU at BARC comprising the participants of all NARS institutions, DAE, DOF, DLS, Agricultural Universities and other GO & NGOs on March 2010. This book having integrated farm technologies (crops, fisheries, livestock, agro-forestry and off-farm activities) is applicable in 150 million homestead areas of Bangladesh. The following thematic areas were considered in this book to follow homestead related technologies :

- i. Production of fruits & vegetables, chewing sugarcane, bamboo & establishment of mini nursery,
- ii. cultivation of different species of fish in homestead pond,
- iii. rearing cows, goats, poultry, pigeon, koel etc.
- iv. making improved chula (চুলা), solar drier and biogas plant,
- v. preparation of compost & vermicompost, mushroom production.
- vi. off-farm activities such as rearing Bees, preparations of various kinds of Prickles, Papor (পাপড়), Mora(মোড়া), Cane mat (শীতল পাটি).

The book was unveiled in a gracious session in July 2011 at BARC, where C. Q. K. Mustak Ahmed, Secretary, Ministry of Agriculture was graced as a chief guest. The session was chaired by Dr. Wais Kabir, Executive Chairman, and Bangladesh Agricultural Research Council. The chief guest opined that the book will create a material window for using modern/appropriate homestead technologies for higher production, nutrition and better livelihood of farm families.

The authors of the book are Dr. Md. Khalequzzaman Akand Chowdhury, Member Director (crops), Bangladesh Agricultural Research Council (BARC), Md. Manowar Hussain, Principal Scientific Officer, Technology Transfer Monitoring Unit, BARC & Dr. Md. Abdul Quayyum, former Chief Scientific Officer Bangladesh Agricultural Research Institute, Gazipur.

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2. Awal, M. A. and M. A. Salam. 2012. Report on Field Monitoring Workshop on SPGR Sub- Projects. Planning and Evaluation Division, BARC, Farmgate, Dhaka
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8. Salam, M. A and P.C. Golder. 2012. Training Manual on Project Development and Management. Planning and Evaluation Division, BARC, Farmgate, Dhaka.
9. Salam, M. A.; P.C. Golder and S. G. Hussain. 2011. Progress of Activities 2010-2011 and Annual Work Plan 2011-2012. Planning and Evaluation Division, BARC, Farmgate, Dhaka.

Fisheries

- M. Z. Ali, M. M. Khan, **M. K. I. Haque**, M. Zaher and S. U. Ahmed. 2011. Approaches to optimizing dietary protein to energy ratio in stinging catfish, *Heteropneustes fossilis* (Bloch, 1792).
- M. Z. Ali and **M. K. I. Haque**. 2011. Feeding regime and dietary protein interactions-an approach to optimizing feeding regime and dietary protein in stinging catfish, *Heteropneustes fossilis* (Bloch, 1792).
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- E. Karim, M.A. Haque, M. Shahab Uddin, **M. J. Rahman** and M. M. Rahman. 2012. Effects of supplementary feeds on growth and survival of striped mullets (*Mugil cephalus*) in outdoor cistern ponds of MFTS, Cox's Bazar. *Int. J. Ani. Fish. Sci.* 5(2):428-432.
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Livestock

1. Chowdhury, S.M.Z.H. and Hossain, S.G. (2011). Report on the progress of Implementation of the Annual Work Plan 2010-2011 and Annual Work plan 2011-2012. Livestock Division, BARC, Farmgate, Dhaka, July 2011.
2. Chowdhury, S.M.Z.H. and Ahmmmed, A. (2011). Annual Report 2010-2011. Livestock Division, BARC, Farmgate, Dhaka, December, 2011.
3. Rahman, S.M.K., Chowdhury, S.M.Z.H. and Kamal, R.M. (2012). Field monitoring report on the activities of the sub-projects implemented under SPGR. Monitoring Group-4, BARC, Farmgate, Dhaka, May 2012.
4. Ahmed, M.U., Chowdhury, S.M.Z.H., Shahjahan, M. and Rahman, M.M. (2012). Field monitoring report on 'Core Research/Technology Transfer' programs implemented in 2011-12 under Research Grant of BARC. Monitoring Group-3, BARC, Farmgate, Dhaka, April 2012.

Soils, NRM

As also mentioned before, the scientists of Soils Unit conducted and attended different workshops home and abroad during 2011-12. The scientists presented papers in some the workshops, which are as follows:

International Workshop: The scientist of Soils Unit attended the workshop entitled "2011 PRC-ADB Knowledge Sharing Platform Agricultural and Rural Development: Improving Farm Productivity and Rural Livelihoods held at Beijing, China during 8-11 November 2011" and presented a paper on "Integration of Agricultural Research and Extension with Practices, Including Strategies in Setting Priorities in Agricultural Research"

National Workshop: The scientist of Soils Unit also presented papers in some national workshops. The scientist of the Unit presented the first and second draft of Fertilizer Recommendation Guide-2012 in two workshops held at BARC during the fourth week of March 2012 and first week of June 2012 respectively. The scientists of the Unit also presented Field Monitoring Reports of the BARC funded research programs conducted at different NARS institutes under revenue budget and SPGR Sub-Projects in the

workshops held at BARC during the second week of May 2012 and third week of June 2012 respectively.

The Soils Unit of BARC is mandated to update and publish Fertilizer Recommendation Guide (FRG) at five years interval. During 2011-12, the Soils Unit completed drafting of updated version of Fertilizer Recommendation Guide-2012. The draft was presented in two workshops held at BARC during the fourth week of March 2012 and first week of June 2012. Suggestions/ comments from the workshop were incorporated in the draft and the draft was finalized. The draft is under process of publication.

Besides, the Soils Unit published the proceedings of the Annual Research Review and Planning Workshop of Soils Programs of the NARS Institutes held during 12-14 September 2011. The Soils Unit also published the proceedings of the Annual Research Review and Planning Workshops and Annual Reports for the year 2011-12 of all the SPGR Sub-Projects coordinated/ implemented by the Unit. Besides, the Unit also published two proceedings of the fertilizer Technical Sub-Committee Meetings held during 2011-12.

AERS

A.S.M. Anwarul Huq, Fatima Mohamed Arshad and Md. Ferdous Alam. 2012. Supply response of mustard in Bangladesh: A co-integration analysis. Scientific Research and Essays. 7(38): 3262-3268. Available online at <http://www.academicjournals.org/SRE>. DOI: 10.5897/SRE10.487, ISSN 1992-2248 ©2012 Academic Journals

Md. Ferdous Alam, Md. Akhtaruzzaman Khan and A.S.M. Anwarul Huq. 2011. "Technical Efficiency in Tilapia Farming of Bangladesh: A Stochastic Frontier Production Approach". Aquaculture International, Journal of the European Aquaculture Society. ISSN 0967-6120. Aquaculture int DOI 10.1007/s10499-011-9491-3. Springer.

Nutrition

Nutrient Composition of Small Indigenous Fish Species (SIS) and Processed SIS of Bangladesh.

Annual progress Report (2011-12) of the SPGR sub-projects "Contaminants and adulterants in food chain and their mitigation".

IV. ADMINISTRATION AND FINANCE

ADMINISTRATION

Governing Body Meeting

The 39th Governing Body Meeting was held 29 September 2011 to review the implementation and progress of the decisions taken in the previous meeting. *Human Resource Development Plan for NARS in Bangladesh* has been placed in the Meeting for discussion. The distinguished members have given emphasis on the development of human resources through relevant training and higher education keeping in mind the purpose of the research priority setting. A draft report on Crop Zoning was also presented in the meeting for discussion. The report identifies the soils and agro-climate favorable to grow 12 major crops and presents those in map for easy understanding. Maps on soil moisture, active soil depth, nutritional status, soil acidity and salinity, agro-climatic factors, etc. have been demonstrated in the meeting. The meeting discussed and reviewed the draft report and opined for further discussion of the plan and for their approval as well.

Executive Council Meeting

The 92nd, 93rd, 94th, 95th and 96th Executive Council Meetings were held on 11 August 2011, 11 August 2011, 5 December 2011, 22 December 2011 and 20 February 2012 respectively. The 1st Executive Council Meeting (according to "Council Law 2012") was held on 25 June 2012. The 92nd Executive Council approved among others the enhanced monthly allowances for Post-Doctoral Fellowship under PIU-BARC, NATP: Phase-I for countries of different regions, research proposal and budget of BARRI and discussed the gratuity and service rule for the recruitment of SSO, PSO and CSOs of the NARS institutes. The 93rd Executive Council Meeting discussed and approved 12 SPGR Proposals and budgets, and allocation of revenue budget for core research, training and other items. The 94th Executive Council Meeting discussed and reviewed the research proposals and approved budgets of BARI, BJRI and BFRI. The 95th and 96th Executive Council Meeting approved the research proposal and budget of BSRI SRDI and BINA for the year 2011-12. The 1st Executive Council Meeting (according to "Council Law-2012") approved the research proposals and budgets of BFRI (Fisheries) and BTRI for the year 2011-12. It also approved the enhanced monthly allowance for In-country PhD Scholars.

Recruitment, Promotion, PRL etc.

During the period, the following officers/staff have been given appointment:

1. Dr. Md. Monirul Islam, Principal Scientific Officer (Nutrition)

2. Dr. M.A. Awaal, Principal Scientific Officer (Planning and Evaluation)
3. Dr. Md. Baktear Hossain, Principal Scientific Officer (NRM)
4. Dr. Md. Jalilur Rahman, Principal Scientific Officer (Fisheries)
5. Mr. Md. Delower Hossain, Senior Assistant Director (Accounts)
6. Mr. Kazi Md. Golam Azam, Account Assistant
7. Mrs. Shahnur Sultana, Telephone Operator
8. Mr. Md. Mosharaf Hossain, Driver
9. Mr. Md. Jahangir Hossain, Driver

Following Officer have been given promotion:

1. Mr. Nasir Uddin, Assistant Director

Following officers have been given selection grade:

1. Mr. Md. Zahidul Islam, Assistant Director (Establishment)
2. Mr. Md. Akbar Ali Shaikh, Assistant Director (Store)

Following officers/staff have gone on PRL:

1. Dr. Sk. Ghulam Hussain, Member-Director (Planning and Evaluation)
2. Mr. Md. Lal Miah, Word processing Assistant
3. Mr. Md. Awal Mia, MLSS

Besides, two promotion committee meetings were held where 6 officers of BARI and 7 officers from BJRI have been given promotion as Chief Scientific Officer.

During the period, a training on "Discipline, office management and service rule" has been organized for the fourth class employees of BARC.

FINANCE

Bangladesh Agricultural Research Council (BARC) is an apex body of National Agricultural Research System (NARS). BARC receipts funds from Development and Revenue Budgets of the Govt. to conduct its annual mandate activities like Research management, Coordination, monitoring, Evaluation, Technology transfer and manpower development and improvement of the production of Rice, pulse, etc. In this respect BARC's Finance Division prepares the annual budget and financial plan of annual activities and accordingly disburses fund for achievement of the goal. It keeps all the record of expenditure incurred during the year and reports to the Ministries, CAO, IMED, Development Partner and other Govt. Offices properly. It also reconciles the Accounts with CAO to prepare the final Accounts which is submitted before the Public Accounts Committee (PAC) of the National Assembly.

Budgeting and Expenditure Control

The Govt. has implemented "Medium Term Budgetary Framework (MTBF)" for some selected Ministries

including Ministry of Agriculture and its Division, Bodies and Corporations since 2005-06. Accordingly BARC prepared budget in the form of MTBF for Revenue Head and Development Projects and submitted to the Ministry for approval. In this respect BARC has a Budget Committee headed by the Executive Chairman, BARC.

Revenue Budget:

Fund Release/Disbursement

As per annual allocation of Budget of the Govt. BARC makes proposal for the release of fund from the Govt. on quarterly basis. In the Financial year 2011-2012 BARC received Tk. 1225.00 lakh for Salary and allowances, Core Research, Technology Transfer and manpower development and operational fund. To implement these activities funds were released to the Agricultural Research Institutes (ARI's) and associated organizations according to the budget plan. The overall statement of Expenditure for 2011-12 is shown below:-

a) Revenue Budget

(Taka in lakh)

Sl. No.	Line item	FY 2011-12	
		Budget	Expenditure
1.	Pay of Officer	185.00	178.34
2.	Pay of Staff	175.00	164.80
3.	Allowances	353.50	329.03
4.	Supply and Services:		
a.	Research Grant	140.00	135.00
b.	Manpower Development/ Training	60.00	59.76
c.	Utility 77.00	75.54	
d.	Other operational	50.50	46.42
5.	Repair and Maintenance	25.50	22.66
6.	Leave Salary & Gratuity	99.00	99.00
7.	Capital Expenditure	65.50	5.50
	Total :-	1231.00	1116.05
8.	(-) Self Income	6.00	5.00
		1225.00	1121.05

b. Core-Research

BARC Implemented 25 no's of Core Research activity during the year under its schedule Research Institute

(SRI) and Associated organizations as per mandate of BARC. The financial progress of the Core Research is as follows:-

Sl #	Name of Institute	No. of Core Research	Financial Progress
1.	Sylhet Agricultural University	3	9,17,200.00
2.	Sher-e-Bangla Agricultural University	4	6,28,000.00
3.	BAURES, Bangladesh Agricultural University	3	45,60,340.00
4.	Soil Recourse Development Institute (SRDI)	3	7,51,000.00
5.	Bangladesh Rice Research Institute (BRRI)	3	2,00,000.00
6.	Bangladesh Agricultural Research Institute (BARI)	3	28,86,829.00
7.	Bangladesh Institute of Nuclear Agriculture (BINA)	3	9,85,600.00
8.	Bangladesh Jute Research Institute (BJRI)	3	3,50,000.00
	Total=	25	1,12,78,969.00

Development

Sub-SPGR:

National Agricultural Technology project (NATP) is a world Bank/IFAD funded project implemented by Project Co-ordination Unit (PCU), Sponsored Public Good Research (SPGR) of Agricultural Research support component under NATP is being implemented by BARC Project implementation Unit (PIU). BARC Head Quarter undertook 14 sub- Project under Sponsored Public Good Research (SPGR) for the financial year 2011-2012 for Research, Adopting Research, extension activities, Enhancing Research capacity, Farm Productivity, Assigning Cropping pattern, Fertilizer Management, Pest Management, Arsenic Management, development of Management efficiency including policy Planning. During the Financial Year 2011-2012 BARC implemented 14 sub SPGR project. Comprehensive Expenditure is summarized below:-

SI #	Sub-SPGR	Salary & Remu.	Research Expenses	Opt. Exp.	Fuel Oil Main	Trn/Work Shop/ Seminar	Publication/ Printing	Contin gencies	Capital Exp.
1	Soil Fertility..... cropping pattern (SFFMP)	5.82	0	0.62	0.80	4.27	0	0.83 (Taka)	5.72 (in lakh)
2	Updating of Fertilizer..... Generated by The NARS	4.20	0	0.56	0	2.64	0	0.17	0
3	Coordinated Project on Arsenic..... plant System	0.25	0	0.46	0	1.50	0	0.07	0
4	Contaminants and adulterants in Food chain and their migration	2.98	0	0.47	0.36	1.01	0	0.76	5.47
5	Carbon Sequestration in Soils of Bangladesh	0.31	0.13	0.25	0	1.00	0.10	0.20	0

SI #	Sub-SPGR	Salary & Remu.	Research Expenses	Opt. Exp.	Fuel Oil Main	Trn/Work Shop/ Seminar	Publication/ Printing	Contin gencies	Capital Exp.
6	Assessment of Land surface water in coastal area	0.36	0	0.23	0.22	1.35	0.30	0.05	0
7	Water Mgt. for Changing climate	5.58	0	0.66	0.31	0.77	0	0.19	4.45
8	Improvement of Agro Forestry Livelihood & Environ.	5.02	0	1.28	0.05	2.14	0	0.83	0
9	Development and up scaling Vegetable Crops	14.73	1.74	2.75	0.15	0.39	0	0.22	0
10	Coordinated sub project on Genetic Resources	0	0	0.50	0	0.45	0	0.13	0
11	Coordinated sub project on Farmers live hood Imp.	0	0	0.41	0	0.72	0	0.37	0
12	Coordinated sub project on Aqua Ecosystems Bd.	9.64	11.61	1.56	1.10	4.88	0	1.62	10.47
13	Surveillance of important Livestock & Poultry of BD	2.69	0	0.07	0	0.50	0	0.03	0
14	Application of GIS Cropping pattern of BD	0.93	0	2.14	0	0	0.24	0.88	8.63

Accounting

BARC's Finance Division maintains its accounts following standard accounting system. It keeps a well-printed Cash Book, Ledger, Advance Register, Budget Control Register and other related ledger to record all transaction during the year accurately.

GOB Audit

During the year GOB local and FAFAD audit team performed audit of all Accounts, Bills, Vouchers and other related records of BARC Revenue budget, Development Project and Program for the financial year 2010-11.

Settlement of audit objection

During the year 2011-12 a remarkable number of audit objection has been settled are appended below:-

Sl. No.	Particular	No.	Settled audit objection
1.	Revenue	4	1,60,97,000.00
2.	Development	5	83,63,000.00
Total :			2,44,60,000.00

Reporting

BARC Finance section keeps all the record of expenditure incurred during the year and reports to the Ministry, IMED, CAO, Development Partner and other Government offices Monthly, Quarterly, Half yearly and Annually.

Reconciliation

It also reconciles the Accounts with CAO to prepare the Final Accounts which is submitted before the Public Accounts Committee (PAC) of the National Assembly.

Retirement benefits

During the year 2011-12 retirement benefits and CPF Payment made to the Officer's and Staff of BARC are

shown below:-

A) CPF Final payment

1.	Officer's	4 No.	Tk. 20,74,453.00
2.	Staff	7 No.	Tk. 15,57,642.00
Total Tk.=			36,32,095.00

B) Gratuity payment

1.	Officer's	4 No.	Tk. 49,35,101.00
2.	Staff	4 No.	Tk. 15,37,009.00
Total Tk.=			64,72,110.00

C) Leave Salary payment: Leave Encashment allowed to the Officer's and Staff during the year are as follows:-

1.	Officer's	5 No.	17,20,887.00
2.	Staff	10 No.	12,34,516.00
Total Tk.=			29,55,403.00

D) CPF Loan:- CPF loan given to the Officer's and Staff during the year and Taka 38,76,470.00 has been recovered against the previous sanctioned loan.

1.	Officer's	8 No.	40,60,000.00
2.	Staff	65 No.	97,52,000.00
Total Tk.=			1,38,12,000.00

Group Insurance

BARC undertook Group Insurance for wellbeing of its Officers and Staff for any unavoidable incident with Jiban Bima Corporation since 36 years.

We mourn loss of our Two colleague i) Late Wali Ullah, MLSS and ii) Late Pankaj Kanti Sarkar, Office Asst. cum computer operator during the year. We received an amount of Tk. 4,33,440/- as compensation under Group Insurance from Jiban Bima Corporation for the aforesaid deceased and payment made to their nominee.

Professional Staff Members

Office of the Executive Chairman

Wais Kabir, PhD, Executive Chairman

Md. Hussyam Uddin Parvez, PS to Executive Chairman

Crops Division

Md. Khalequzzaman Akanda Chowdhury, PhD, Member Director

Abul Kalam Azad, PhD, Chief Scientific Officer

Md. Aziz Zilani Chowdhury, PhD, Principal Scientific Officer

S.M. Khorshed Alam, PhD, Principal Scientific Officer

Mian Sayeed Hassan, PhD, Principal Scientific Officer

Planning and Evaluation Division

Paresh Chandra Golder, PhD, Chief Scientific Officer

Md Abdus Salam, PhD, Principal Scientific Officer

Md. Abdul Awal, Principal Scientific Officer

Natural Resources Management Division

Md. Ahmad Ali Hassan, PhD, Member Director

Sultan Ahmmed, PhD, Chief Scientific Officer (Agricultural Engineering)

Mohammad Shahjahan, PhD, Chief Scientific Officer (Forestry)

Md. Abdus Satter, PhD, Chief Scientific Officer (Soils)

Shaikh Mohammad Bakhtiar, PhD, Principal Scientific Officer (Soils)

Md. Baktear Hossain, PhD, Principal Scientific Officer (Soils)

Fisheries Division

Md. Kabir Ikramul Haque, PhD, Chief Scientific Officer

Md. Jalilur Rahman, PhD, Principal Scientific Officer

Livestock Division

Shah Md. Ziqrul Haq Chowdhury, PhD, Chief Scientific Officer

Agricultural Economics and Rural Sociology Division

S M Khalilur Rahman, PhD, Member Director

A.S.M. Anwarul Huq, PhD, Principal Scientific Officer

Fauzia Yasmin, PhD, Principal Scientific Officer

Nutrition Unit

Md. Monirul Islam, PhD, Principal Scientific Officer

Technology Transfer Monitoring Unit

Md. Khalequzzaman Akanda Chowdhury, PhD, Director (Addl Charge)

Md. Abul Kashem, PhD, Principal Scientific Officer & Director, PIU-BARC, NATP

Fauzia Yasmin, PhD, Principal Scientific Officer

Md. Monowar Hussain, Senior Scientific Officer

Agricultural Information Centre

Dil Afroz, Director

Md. Rafique Mostafa Kamal, Principal Librarian

Shah Md Monir Hossain, Senior Scientific Editor

Afroza Anjum, Senior Reprographic Officer

Susmita Das, Information Officer

Computer and GIS Unit

Md. Abeer Hossain Chowdhury, Director

Hassan Md. Hamidur Rahman, Senior System Analyst

Md. Shohid Uddin Bhuiyan, System Analyst

Md. Abdul Mabin, Programmer

Mihir Kanti Sarker, Data Entry Officer

Md. Ayub Hossain, Data Entry Officer

Manpower and Training Unit

M. Aminuzzaman, Principal Training Officer

Md. Mostafizur Rahman, Senior Training Officer

Administration and Finance Division

Meraz Uddin Ahmed, PhD, Member Director

Support Service Unit

Md. Kabir Ikramul Haque, PhD, Director (SS)

Mr. Md. Mahbubul Hassan, Senior Assistant Director (Establishment)

Mr. Md. Zahidul Islam, Assistant Director (Establishment)

Mr. Md. Akbar Ali Shaikh, Assistant Director (Store)

Mr. M Nazim Uddin, Senior Assistant Director (Proc)

Mr. Md. Ershad Ali, Executive Engineer

Finance Unit

Mr. Mozibar Rahman, Director (Finance)-Lien

Mr. Ajit Kumar Chakraborty, Deputy Director (Accounts)

Mr. Md. Abdul Mottakin, Sr. Assistant Director (Audit)

Mr. Md. Jashim Uddin Chowdhury, Sr. Assistant Director (Budget)

Mr. Md. Delower Hossain, Sr. Assistant Director (Accounts)

Mr. Md. Harun-or-Rashid, Assistant Director (Audit)

PIU-BARC, NATP

Md. Abul Kashem, PhD, Director

Md. Anwar Iqbal, Monitoring & Evaluation Expert

Dr. Md. Abdus Siddique, PhD, Training & Communication Expert

Mr. Khan Ferdausar Rahman, Manager (Financial Manager)

Mr. Md. Anwar Hossain, Procurement Expert

Mr. Md. Habibur Rahman, Assistant Manager (Accounts)

Mr. Md. Anwarul Islam, Assistant Manager (Procurement)

Foreign Training/Seminar/Workshop/Meeting

Sl. No	Name, Designation	Name of Program	Duration	Country	Funding org.
1.	Dr. Wais Kabir, Executive Chairman, BARC	International workshop on Knowledge, tools and lessons for informing the design and implementation of food security strategies in Asia	14-16 November 2011	Kathmandu, Nepal	IFPRI, US
		Workshop on Agricultural R&D In the Asia Pacific Region: The Need to Monitor Investments, Capacities and Institutional Changes	16-17 Feb. 2012	Bangkok, Thailand	IFPRI/ APPAARI
		Eighth Session of the Governing Council of the Centre for the Alleviation of Poverty through Sustainable Agriculture (CAPSA)	21-22 March 2012	Yogyakarta, Indonesia	NATP
		2 nd . General Assembly of the Asian Food Agriculture Cooperation Initiative (AFACI)	2-5 May, 2012	Suwon & Jelu, Republic Korea	NATP
		Global Conference on Role of Women in Agriculture	13-15 March, 2012	New Delhi, India	NATP
2	Mr. Mohammad Monowar Hussain SSO (TTMU), BARC	Regional Workshop on Up-scaling of Sustainable Eco- friendly Farming Technology in SAARC Region	5-6 July, 2011	Nepal	NATP
		AFACI Training Workshop on Rural Development for Higher Level Officials	22-26 August, 2011	Republic of Korea	AFACI
3	Mr. Md. Hamid, Additional Secretary, Ministry of Agriculture	2 nd . General Assembly of the Asian Food Agriculture Cooperation Initiative (AFACI)	2-5 May, 2012	Suwon & Jelu, Republic Korea	NATP
4	Dr. Md. Khalequzzaman, MD (Crops), BARC	(a) Thirteen Regular Session of the Commission on Genetic Resources for Food and Agriculture (b) Special Information Seminar on Climate Change and Genetic Resources for Food and Agriculture	(a) 18-22 July, 2011 (b) 16 July, 2011	Rome, Italy	FAO
		Final National Focal Point Meeting, symposium on Plant Genetic Resources	16-20 October, 2011	Tsukuba, Japan	FAO & National Institute of Agrobiological Sciences
		SAARC Regional Conference on New Frontier in Agricultural Genomics and Biotechnology	5-7 June, 2012	Islamabad, Pakistan	NATP
5.	Dr. Abul Kalam Azad, Director, SAC and CSO (Crops), BARC	Regional Consultative Workshop on “ SAARC Pesticide Information Sharing Network (SPINet)	28 June-02 July, 2011	Sri Lanka	SAARC
		Forty-first Session of the Programming Committee Meeting of SAARC	17-19 October, 2011	Nepal	SAARC
		Workshop on “Current Status and Future Prospect of Pulse Production in SAARC Countries “	24-25 October, 2011	Nepal	SAARC
		Regional Consultation workshop on “ Public Support in the Production and Marketing System in Agriculture of SAARC Countries	14-15 December, 2011	Nepal	SAARC
		Regional workshop on “ Enhancing Oilseed Production through Improved Technology in Agriculture of SAARC Countries	20-21 December, 2011	Hyderabad., India	SAARC
		(1) Regional training workshop on “Quality control of milk during production, processing & marketing and introduce to novel technologies for dairy products diversification & (2) Consultation meeting on “Operational Agro meteorological Services in SAARC and RA II Region	(1) 18 April, 2012 (2) 20-21 April, 2012	(1) Carnal, India (2) Pune, India	SAARC

Annexure – II (Cont'd..)

Sl. No	Name, Designation	Name of Program	Duration	Country	Funding org.
		Regional Consultation Workshop on “Brood-stock Management and Dissemination of Improved Fish Breed in the SAARC Countries	13-16 March, 2012	Islamabad, Pakistan	SAARC
		Second Training Workshop on “Developing capacity cropping systems modeling to promote food security and sustainable use of water resources in South Asian	28 May – 01 June, 2012	Candy, Sri Lanka	SAARC- Australia Project
6	Dr. Md. Samsul Hoq, CSO (Planning), BARI	Study visit on Food Crop Marketing, Value Addition & Supply Chain Management	30 June-09 July, 2011	Indonesia	NATP
7	Ms. Kamrunahar, DS, MOA	-Do-	-Do-	-Do-	-Do-
8	Dr. A.S.M. Anowarul Hoque, CSO (AERS), BARC	Impact Assessment of Agricultural Research	2-19 August, 2011	Philippines	NATP
		Capacity Building Workshop on Agricultural Policy Research	14-18 November, 2011	Kandy, Sri Lanka	CAPSA
9	Dr. Md. Abdus Salam, PSO (P&E), BARC	Impact Assessment of Agricultural Research	2-19 August, 2011	Philippines	-Do-
10	Dr. Md. Monirul Islam, PSO (Nutrition), BARC	Impact Assessment of Agricultural Research	2-19 August, 2011	Philippines	-Do-
		Forty-fourth Session of the CODEX Committee on Food additives	12-16 March, 2012	Hangzhou, China	NATP
11	Dr. Fauzia Yasmin, PSO (AERS), BARC	Research on Agricultural Productivity Management and Monitoring Systems	5-7 October, 2011	Tokyo, Japan	APO
12	Mr. Mustafizur Rahaman PRO and STO (A.D), BARC	AFACI Training Workshop on Rural Development for Higher Level Officials	22-26 August, 2011	Republic of Korea	AFACI
		Training Course on working with Stakeholders Dialogue	17-26 May, 2012	Berlin, Germany	GIZ
13	Mrs. Dil Afroz, Director, Agriculture Information Center, BARC	Workshop on “AGROVOC Management and Application, using VocBench”	12-14 October, 2011	Hyderabad, India	NATP
14	Mrs. Susmita Das, Senior Documentation Officer, BARC	-Do-	-Do-	-Do-	-Do-
15	Dr. Mohammad Shahjahan, CSO (Forestry), BARC	Biosafety Meeting	03-06 October, 2011	Joypur, India	ABSP- II Could not go because of late issuance of GO.
16	Dr. S.M. Khalilur Rahman, Member Director (AERS), BARC	Study visit on Food Crop Marketing, Value Addition & Supply Chain Management	30 June-09 July, 2011	Indonesia	NATP
		15 th CORRA Annual Meeting and APAARI Executive Meeting and Expert Consultation Meeting	24-28 October, 2011	Philippines and Taiwan	IRRI/APAARI/ PCAARD
		Inception Meeting on “Network for Knowledge Transfer on Sustainable Agricultural Technologies and Improved Market Linkages in South and Southeast Asia (SATNET	13-14 March, 2012	Bogor, Indonesia	Centre for Alleviation of Poverty through Sustainable Agriculture (CAPSA)
17	Dr. Md. Abdur Razzaque, Project Director (PCU), NATP	Asian Regional Workshop on Sustainable Agriculture, Biotechnology and Biosafety	25-26 October, 2011	Thailand	ISAAA
18	Dr. Md. Azgar Ali Sarkar, CSO, BINA	Using Climate Scenario and Analogues for Designing Adaptation Strategies in Agriculture	19-23 September, 2011	Nepal	CGIAR
19	Dr. Mozibur Rahman, PSO, BJRI	-Do-	-Do-	-Do-	-Do-

Sl. No	Name, Designation	Name of Program	Duration	Country	Funding org.
20	Dr. Md. Abdus Sattar, Chief Scientific Officer (Soils), BARC	Workshop on “Knowledge Sharing Platform”	8-11 November, 2011	China	ADB
		International Study Tour Program on Fertilizer Related Issues	10-18 June, 2012	India & Thailand	NATP
21	Dr. Sulttan Ahmmed, CSO (Ag. Eng.) BARC	The Forth Expert Group Meeting on Agriculture Co-operation	14-15 December, 2011	Nepal	Nepal Govt./NATP
22	Mr. Mihir Kanti Sarkar, Data Entry Office, BARC	Consultation Workshop on Plant Genetic Resources National Information Sharing, Mechanism for monitoring the Global Plan of Action (NISM-GPA)	6-7 December, 2011	New Delhi, India	FAO
23	Mr. Abeed Hossain Chowdhury, Director (Computer & GIS), BARC	Expert Workshop for Agricultural Technology Information Network in Asian(ATIN)	8-10 December, 2011	Vientiane, Lao, PDR	AFACI Pan –Asia ATIN Project
		“Ag MIP South Asia Regional Workshop”	20-24 February, 2012	India	Ag MIP-Columbia University Center for Climate Systems Research
		Participation (Study visit) in the technical inspection and verification of Equipment and software for ICT & MIS	16-20 April, 2012	Singapore	NATP
24	Mr. Ayub Hossain, Data Entry Office, BARC	Expert Workshop for Agricultural Technology Information Network in Asian(ATIN)	8-10 December, 2011	Vientiane, Lao, PDR	Vientiane, Lao, PDR
25	Dr. Meraz Uddin Ahmed Member Director (Admin. & Finance), BARC	Study Visit on Research Grant in Australia	12-23 May, 2012	Australia	NATP
26	Dr. Parseh Chandra Golder, CSO (P &E), BARC	-Do-	-Do-	-Do-	-Do-
27	Mr. Mohammed Azizul Haque, SAS, Policy Section-5, Ministry of Agriculture	-Do-	-Do-	-Do-	-Do-
28	Dr. Kabir Ekramul Hoq, CSO (Fisheries), BARC	Training Course on working with Stakeholders Dialogue	17-26 May, 2012	Berlin, Germany	GIZ
29	Dr. Md. Abul Kashem, Director (TTMU), CC	Training Course on working with Stakeholders Dialogue	17-26 May, 2012	Berlin, Germany	GIZ
30	Dr. Md. Al-Amin, CSO, BARI	SAARC Regional Conference on New Frontier in Agricultural Genomics and Biotechnology	5-7 June, 2012	Islamabad, Pakistan	NATP
31	Md. Nazmul Hassan, PSO, SRDI	International Study Tour Program on Fertilizer Related Issues	10-18 June, 2012	India & Thailand	IFDC
32	Dr. A K M Shameem Alam, Focal Point Officer, DAE	-Do-	-Do-	-Do-	-Do-

In-country Training/Seminar/Workshop/Meeting**Training**

Division/ Unit (1)	Activity (2)	Venue (3)	Duration (4)	No. of Participant (5)
	(a) Training on Post-harvest Management of Fruits and Vegetables	BARC	2 days	35
	(b) Training on Plant Bio-security and Sanitary & Phyto-sanitary measures	BARC	2 days	40
TTMU	(a) Training of field level DAE Officers (TOT) for Technologies generated from different NARS institutions	BARC	2 days	30
	(b) Training of field level DLS Officers (TOT) for Technologies generated from different NARS institutions	BARC	1 day	30
	(c) Training of field level DFO Officers (TOT) for Technologies generated from different NARS institutions	BARC	1 day	30
NRM (Agril. Eng. Unit)	Training on use of Farm machinery and Efficient Irrigation System Management (Participants from NARS/DAE)	BARC/ BARI /BRRI/ BSRI	4 days	40
Forestry	Training Workshop on Forestry Technologies for Professionals (BARC, DAE, BFIDC, BARI, DF, Universities, NGO & Others).	BARC	2 days	60
Nutrition	i) Training on Dissemination of nutrition information among school and madrasa teachers	BAN-HRDB	5 days(3 batch)	Per batch 30x3=90
	ii) Training on food based nutrition in the light of Processing and preservation of small entrepreneurs	BAN-HRDB	5 days(3 batch)	Per batch 30x3=90
	Training Workshop on Technical Report Writing and Editing	BARC	5 days	25
	Training on Econometric Analysis through Different Computer Software (Participants from NARS)	BARC	5 days	18
	Training on e-Governance, Unicode, Internet, Email.	BARC	5 days	40
			Total	528

Training (NATP)

Sl.	Name of Training	Duration	Number Participants	Venue
1	Training Workshop on Implementation Procedure of SPGR Sub-projects	26-27 July, 2011	57	BARC Training Hall
2	Training on Research Methodology	10-22 Sept, 2011	30	GTI, Mymensingh
3	Training on Research Methodology	24 Sept - 06 Oct, 2011	30	GTI, Mymensingh
4	Training on Research Methodology	09-21 Oct, 2011	30	GTI, Mymensingh
5	Training on English Language Proficiency	11 Sept, 2011 to 03 Jan, 2012	5	NPDA, Dhaka
6	Training on Financial Management & Procurement for SPGR Sub-project	08-10 January, 2012	35	BARC Conference Room-1
7	Training on ToT for UFO	21-23 January, 2012	30	BFRI, Mymensingh
8	Training on Financial Management & Procurement for SPGR Sub-project	22-24 January, 2012	37	Training cum Conference Hall, BARC
9	Crop production technology of BARI mandate crops under environmental stress condition for NARS scientists	29 Janu-02 February, 2012	20	BARI, Gazipur
10	Foundation Training	05 February to 03 June 2012	40	BARD, Comilla
11	Training on Financial Management & Procurement for SPGR Sub-project	7-9 February 2012	40	Training cum Conference Hall, BARC
12	Identification of major disease and insect pest of important crops and their management	12-16 February, 2012	30	BARI, Gazipur
13	Training on ToT for UAO	18-20 February 2012	30	BRRI, Gazipur

Annexure – II (Cont'd..)

Sl.	Name of Training	Duration	Number Participants	Venue
14	Identification of major disease and insect pest of important crops and their management	04-08 March, 2012	30	BARI, Gazipur
15	Administrative and Financial Management for CSO/PSO of NARS Scientists	05-18 March 2012	33	BARD, Comilla
16	Crop production technology of BARI mandate crops under environmental stress condition for NARS scientists	11-15 March, 2012	20	BARI, Gazipur
17	Training on ToT for UAO	18-20 March 2012	30	BSRI, Pabna
18	Use and maintenance of modern lab equipment training for NARS scientists	20-22 March, 2012	20	BARI, Gazipur
	Training on ToT for UAO	7-9 April 2012	30	BINA, Mymensingh
20	Training on Research Development Management	08-12 April, 2012	25	Training cum Conference Hall, BARC
21	Advanced Biometry training course for NARS scientists	15-19 April, 2012	20	BARI, Gazipur
22	Participatory Training on On-Farm Research Methodology	15-20 April, 2012	30	BARI, Gazipur
23	Use and maintenance of modern lab equipment training for NARS scientists	16-18 April, 2012	20	BARI, Gazipur
24	Advanced Biometry training course for NARS scientists	06-10 May, 2012	20	BARI, Gazipur
25	Identification of major disease and insect pest of important crops and their management	06-10 May, 2012	30	BARI, Gazipur
26	Application of software's for agricultural research and development.	13-24 May 2012	20	BARI, Gazipur
27	Participatory Training on On-Farm Research Methodology	19-24 May, 2012	30	BARI, Gazipur
28	Identification of major disease and insect pest of important crops and their management	20-24 May, 2012	30	BARI, Gazipur
29	Seed Quality Management	21-23 May 2012	40	Training cum Conference Hall, BARC
30	Use and maintenance of modern lab equipment training for NARS scientists	22-24 May, 2012	80	BARI, Gazipur
31	Advanced Biometry training course for NARS scientists	27-31 May, 2012	20	BARI, Gazipur
32	Use and maintenance of modern lab equipment training for NARS scientists	28-30 May, 2012	20	BARI, Gazipur
33	Application of software's for agricultural research and	10-21 June, 2012	20	BRRI, Gazipur
34	Identification of major disease and insect pest of important crops and their management	10-14 June, 2012	30	BARI, Gazipur
35	Rules Discipline and Office Management for 4th Class Staff of BARC	17-19 June, 2012	34	Training Cum Conference
36	Rules Discipline and Office Management for 4th Class Staff of BARC	21-23 June, 2012	34	Training Cum Conference
Total			1080	

Seminar/workshop Activities: (Revenue)

Division/ Unit	Activity	Venue	Duration	No. of Participant
(1)	(2)	(3)	(4)	(5)
Crops	National Workshop on Research Achievement of past ten years in Pulses & Oilseeds and Future Research Strategies for Sustainable Production and Food Security	BARC	2 days	60
	Review Workshop on Crop Improvement Programme: Research Progress 2011-12 & Research Programme 2012-13	BARC	2 day	60
Livestock	Workshop on "Important Infectious Zoonotic Diseases in Bangladesh"	BARC	1 day	50
P&E	Workshop on Research and Technology Transfer Programme	BARC	2 days	100
	Annual Workplan Review Workshop.	BARC	1 day	50
AERS	Review of Socio-Economic Research Program and Future Research Program of NARS Institutes	BARC	1 day	85

Division/ Unit	Activity	Venue	Duration	No. of Participant
(1)	(2)	(3)	(4)	(5)
	Women Contribution to Agricultural Research and Technology from different NARS Institutes	BARC	1 day	85
	Research Review and Planning Workshop on Soils Program of NARS Institutes	BARC	3 days	80
Forestry	Workshop on Constraints and opportunities of Agro-forestry in newly accreted char land of Bangladesh	BARC	1 day	35
	Bamboo production of different varieties & Utilizations	BARC	1 day	70
NRM Ag. Eng.	Agricultural Engineering Research Planning Workshop	BARC	2 days	80
P&E	Project Proposal Review Workshop	BARC	1 day	60
			Total	815

Seminar/Workshop (NATP)

Sl. No.	Workshops/ Seminars	Duration	Participants (No.)	Venue
1	Annual Review Workshop on SPGR Sub-projects under Crops	09 August, 2011	65	Training cum Conference Hall, BARC
		10 August, 2011	55	BARC Conference Room-1
2	High Yielding Dairy Breed Development in Bangladesh	28-29 September 2011	70	BLRI Auditorium
3	Customized Information Management System of BARC	10 November, 2011	40	Conference Hall-1, BARC
4	Day-long Discussion / Dialogue Workshop on HRDM	25 October, 2011	30	BARC Conference Room-2
5	Workshop on Learning of the ToT on IA and its Application in Bangladesh Agriculture	02 November, 2011	75	BARC Conference Room-1
6	Workshop on Draft Final Report on HRDM	15 November, 2011	60	BARC Conference Room-1
7	Progress Review Workshop for In-Country PhD Scholars	19-20 November, 2011	100	BAU, Mymensingh
8	Implementation Progress Review Workshop of the SPGR sub-projects under AERS	15 December, 2011	48	BARC Conference Room-1
9	Regional Workshop of Technology Transfer of BARI	06-07 May, 2012	150	BARI Auditorium
10	Regional Workshop of Technology Transfer of BARI	09-10 May, 2012	150	BARI Auditorium
11	Regional Workshop of Technology Transfer of BARI	14-15 May, 2012	150	BARI Auditorium
12	Regional Workshop of Technology Transfer of BARI	05-06 June, 2012	150	BARI Auditorium
13	Progress Review Workshop of 5 SPGR sub-projects under AERS	19 April, 2012	50	Conference Hall-1, BARC
14	SPGR Field Monitoring Workshop	09-10 May 2012	80	Conference Hall-1, BARC
15	Progress Review Workshop of SPGR sub-projects under Crops	29-30 May 2012	116	Conference Hall-1, BARC
16	Regional Workshop on Research-Extension Review and Programme Planning of BARI	28-29 May, 2012	70	BARI, Joydebpur, Gazipur
17	Regional Workshop on Research-Extension Activities and Programme Planning of BARI	29-31 May, 2012	80	OFRD, BARI, Alamnagar, Rangpur
18	Regional Workshop on Research-Extension Review and Programme Planning of BARI	29-31 May, 2012	70	RARS, BARI, Jamalpur
19	Regional Workshop on Research-Extension Review and Programme Planning of BARI	29-31 May, 2012	80	RARS, BARI, Ishurdi, Pabna.
20	Regional Workshop on Research-Extension Review and Programme Planning of BARI	29-31 May, 2012	80	RARS, BARI, Jessore
21	Regional Workshop on Research-Extension Review and Programme Planning of BARI	27-29 May, 2012	70	RARS, BARI, Rahmatpur, Barisal
22	Regional Workshop on Research-Extension Review and Programme Planning of BARI	29-31 May, 2012	60	RARS, BARI Hathazari, Chittagong
23	Regional Workshop on Research-Extension Review and Programme Planning of BARI	30 May, 2012	60	ARS, BARI, Comilla., Comilla-Sylhet
24	Regional Workshop on Research Extension Review and Programme Planning of BARI	June 6-7, 2012	35	Khagracharri, BARI Chittagong Hill Tract
25	Review Workshop on Agro-Forestry Research Activities of Different Institute and Universities	5-6 June 2012	70	BARC Conference-1
26	Progress Review Workshop on SPGR Livestock Sub-projects	14 June, 2012	80	BARC Conference-1
	Total		2144	

THE GOVERNING BODY

BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1	Honorable Minister for Agriculture	Chairman
2	Honorable Minister for Fisheries and Livestock	Co-Chairman
3	Honorable Minister for Environment and Forests	Co-Chairman
4	Parliament Member	Member
5	Parliament Member	Member
6	Secretary, Ministry of Agriculture	Member
7	Secretary, Ministry of Fisheries and Livestock	Member
8	Secretary, Ministry of Environment and Forests	Member
9	Secretary, Ministry of Commerce	Member
10	Member (Agriculture), Planning Commission	Member
11	Vice Chancellor, Bangladesh Agricultural University	Member
12	Vice Chancellor, Bangabandhu Sheikh Mujibur Rahman Agricultural University	Member
13	Executive Chairman, Bangladesh Agricultural Research Council	Member
14	Dr. Wahiduddin Mahmud, Professor, Dept. of Economics, Dhaka University	Member
15	Director General, Department of Agricultural Extension	Member
16	Director General, Department of Livestock Services	Member
17	Director General, Department of Fisheries	Member
18	Director General, Department of Environment	Member
19	Chief Conservator of Forest, Department of Forest	Member
20	Joint Secretary, Ministry of Establishment	Member
21	Joint Secretary, Ministry of Finance	Member
22	Dr. Shah Md. Hasanuzzaman, Scientist Emeritus	Member
23	Professor M. Nurul Islam, Institute of Appropriate Technology, BUET	Member
24	Mr. Kafil Uddin Ahmed, Chairman, Bangladesh Fertilizer Association	Member
25	Managing Director, Palli Karma Shahayak Foundation	Member
26	Mr. Shajahan Ali Badsha, Vill: Solimpur, P.O. Joynagar, P.S. Ishurdi, Dist. Pabna	Member

THE EXECUTIVE COUNCIL

BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1.	Executive Chairman, BARC	Chairman
2.	Director General, BARI	Member
3.	Director General, BRRI	Member
4.	Director General, BJRI	Member
5.	Director General, BINA	Member
6.	Director General, BSRI	Member
7.	Director General, BLRI	Member
8.	Director General, BFRI (Fisheries)	Member
9.	Director, BTRI	Member
10.	Director, BFRI (Forest)	Member
11.	Director, SRDI	Member
12.	Member Director (NRM), BARC	Member
13.	Member Director (Crops), BARC	Member
14.	Member Director (Fisheries), BARC	Member
15.	Member Director (AERS), BARC	Member
16.	Member Director (Livestock), BARC	Member
17.	Member Director (Planning and Evaluation), BARC	Member
18.	Member Director (Administration and Finance), BARC	Member-Secretary

